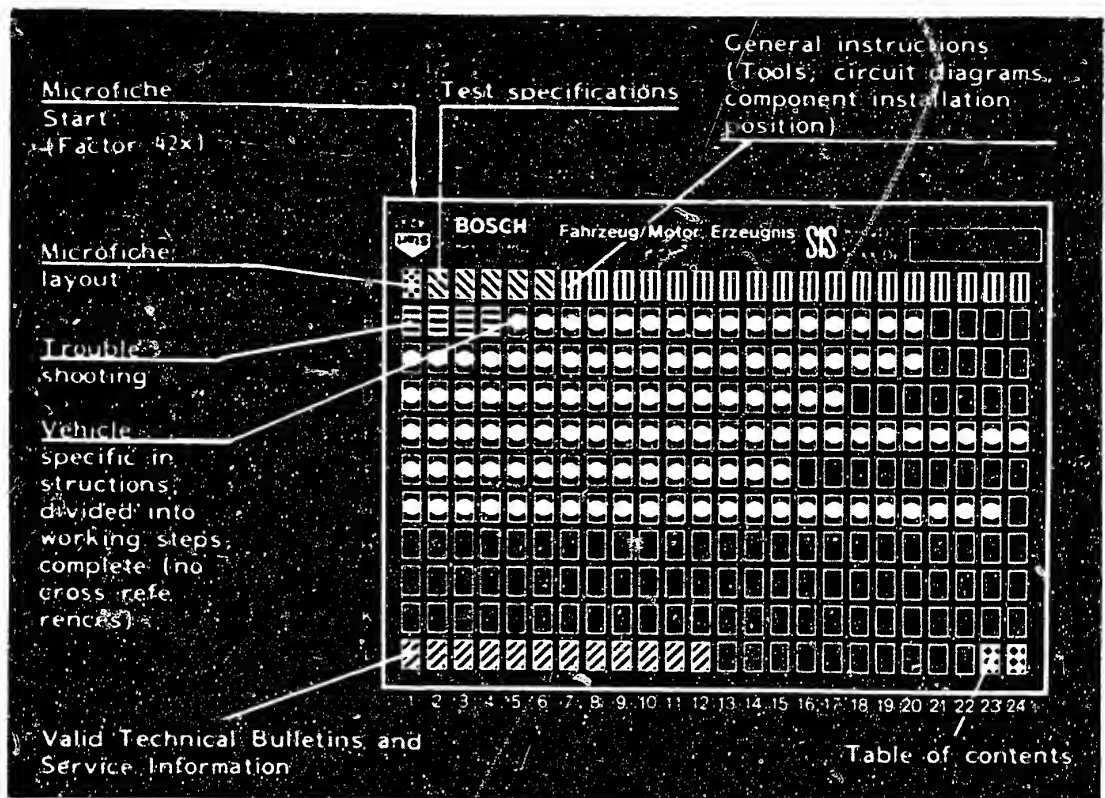


# Microfiche layout



1. Read from left to right
2. Title of microfiche (appears on each coordinate)

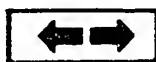
<b>E 16</b>	Product/assembly/test step	
	Vehicle/engine	

Coordinate

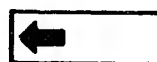
3. Limits of section



Beginning



Mid-section



End



One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.
5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

**C 6**

**A1**

Trouble-Shooting Plan



## 1. Test specifications

### 1.1 Electric fuel pump

**C3**

Test step

Test specifications

Fuel delivery

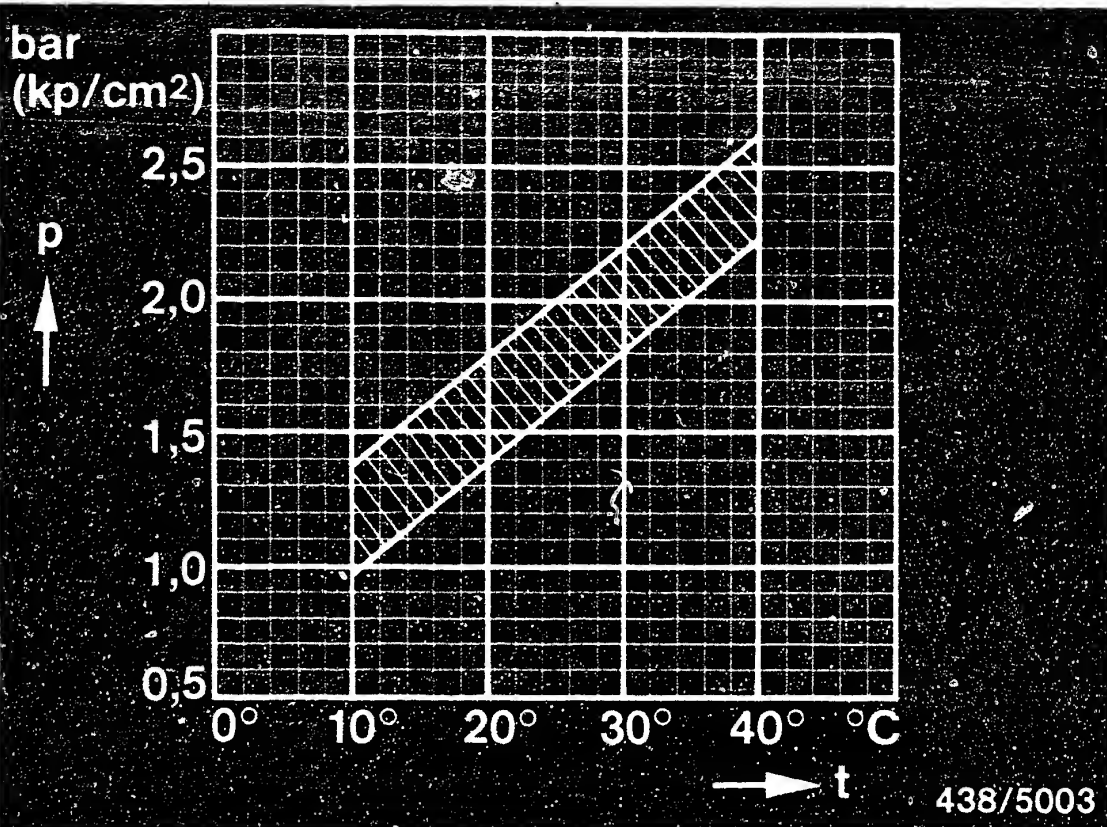
min. 750 cm<sup>3</sup>/30 s

**A2**

Test specifications

BMW 320i/520i 4-cylinder engine





p = Control pressure (gauge pressure)

t = Ambient temperature

## 1.2 Control pressure "cold"

**D1**

For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator.

Setting value: 510...550 mbar  
(385...415 mmHg)

Part no. of warm-up regulator: 0 438 140 005

(Versions for intake-manifold-pressure-controlled full-load enrichment).

**A3**

Test specifications

BMW 320i/520i 4-cylinder engine



1.3 Control pressure "warm"**C8**

(Versions for intake-manifold-pressure-controlled full-load enrichment).

- Test at atmospheric pressure (without vacuum):

Part no. of warm-up regulator

0 438 140 005

2.7...3.1 bar (2.8...3.2 kgf/cm<sup>2</sup>)

- For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator.

Setting value:

510...550 mbar

(385...415 mmHg)

Part no. of warm-up regulator

0 438 140 005

3.4...3.8 bar (3.5...3.9 kgf/cm<sup>2</sup>)

\* Pressures in the test specification table are given in bar (gauge pressure) and/or in kgf/cm<sup>2</sup> (gauge pressure)





## Test step

## Test specifications\*

### 1.4 Leak test on full-load diaphragm

**D16**

Setting value:  
510...550 mbar  
(385...415 mmHg)

Part no. of warm-up regulator  
0 438 140 005

Maximum pressure drop

100 mbar (75 mmHg)/15 s.

### 1.5 Primary pressure

**E1**

Part no. of fuel distributor  
0 438 100 005 } Checking value  
0 438 100 023 } Setting value

4.5...5.2 bar  
(4.6...5.3 kgf/cm<sup>2</sup>)  
4.7...4.9 bar  
(4.8...5.0 kgf/cm<sup>2</sup>)

### 1.6 Leak test

**E9**

Minimum pressure  
after 10 minutes:  
after 20 minutes:

1,9 bar (2,0 kgf/cm<sup>2</sup>)  
1,7 bar (1,8 kgf/cm<sup>2</sup>)

### 1.7 Injection valves

**F7**

0 437 502 007  
Opening pressure:

2,5...3,6 bar  
(2,6...3,7 kgf/cm<sup>2</sup>)

\* Pressures in the test specification table are given in bar (gauge pressure) and/or in kgf/cm<sup>2</sup> (gauge pressure).

**A5**

Test specifications

BMW 320i/520i 4-cylinder engine



## Test step

**G1**

### 1.8 Fuel distributor

Comparative measurement of deliveries from individual outlets:

Fuel distributor no. 0 438 100 005 0 438 100 023	Setting point cm <sup>3</sup> /min.	Max. allowable delivery cm <sup>3</sup> /min.
Idle	6.0	6.8
Part load	40.0	44.0
Full load	160.0	175.0

### 1.9 Idle adjustment \*

**G14**

Idle speed:

320i

520i

850...950 min<sup>-1</sup>

CO concentration:

Europe model:

max. 3.0 % by vol. CO

Sweden model:

max. 1.5 % by vol. CO

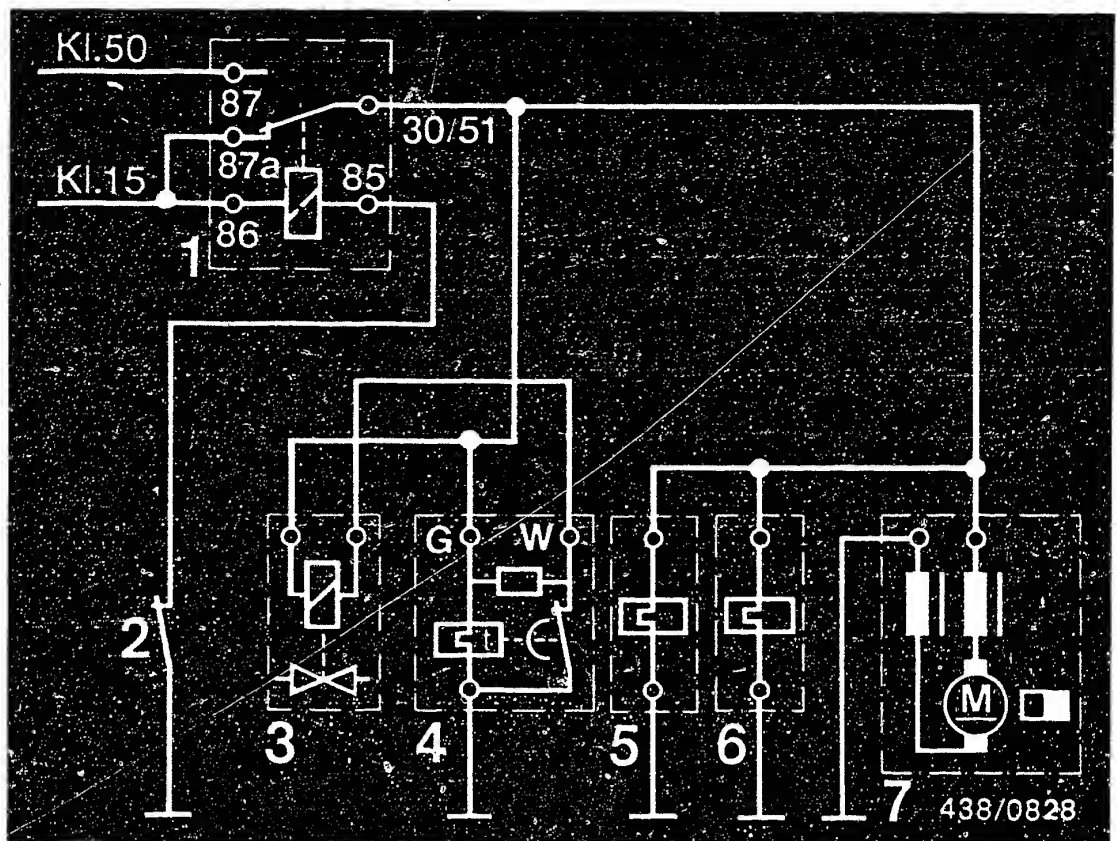
\* Engine at normal operating temperature.  
Air conditioner switched off.

**A6**

Test specifications

BMW 320i/520i 4-cylinder engine





- |                        |                          |
|------------------------|--------------------------|
| 1 = Relay              | 4 = Thermo-time switch   |
| 2 = Air-sensor contact | 5 = Warm-up regulator    |
| 3 = Start valve        | 6 = Auxiliary-air device |
|                        | 7 = Electric fuel pump   |

## 2. Electrical safety circuit

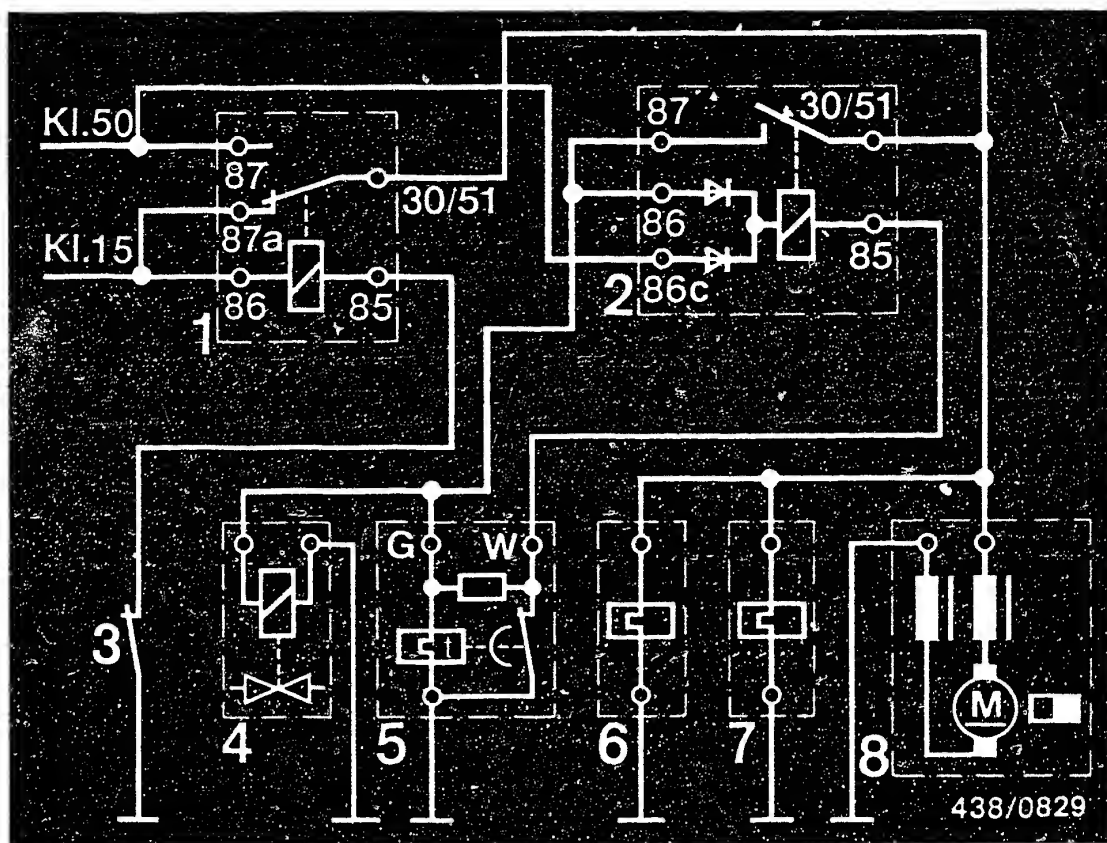
### 2.1 Circuit diagrams

- BMW 320i/520i 1976 model

The safety circuit employs a relay and the air-flow sensor contact.

Due to the electrical energization of terminal 15 the start valve injects during cold starting not only during the starting period, but throughout the entire switching time of the thermo-time switch.





- |                               |                          |
|-------------------------------|--------------------------|
| 1 = Relay                     | 5 = Thermo-time switch   |
| 2 = Prolonged-injection relay | 6 = Warm-up regulator    |
| 3 = Air-flow sensor contact   | 7 = Auxiliary-air device |
| 4 = Start valve               | 8 = Electric fuel pump   |

● BMW 320i/520i 1977/1978 models

The safety circuit employs a relay and the air-flow sensor contact.

Due to the additional, so-called prolonged-injection relay, the start valve injects during cold starting not only during the starting period, but throughout the entire switching time of the thermo-time switch.

With this safety circuit the control valve is triggered not only by the thermo-time switch, but also by a prolonged-injection relay.

The start valve and terminal "G" of the thermo-time switch are jointly connected to terminal 87 of the prolonged-injection relay.

Prolonged-injection relay BMW No.: 61 31 1 362 224.

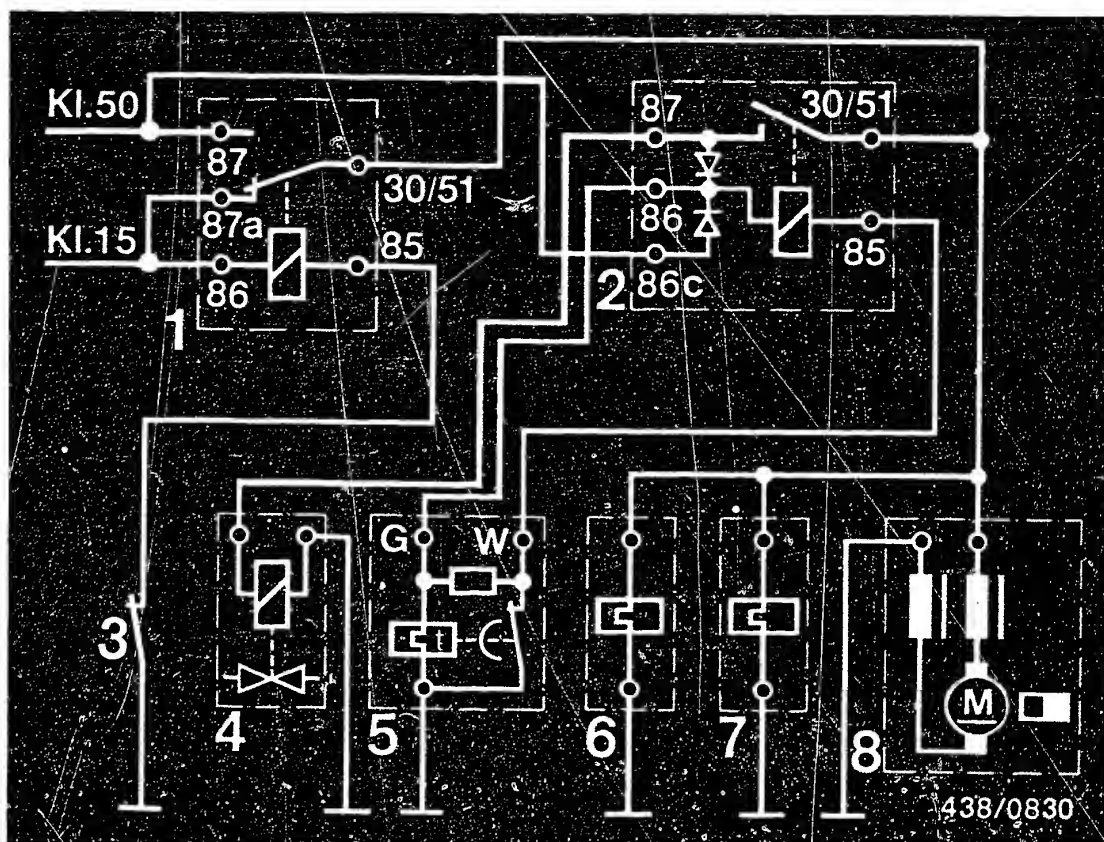
If the complaint "poor cold starting" is encountered on these vehicles, the cause may be the shunt resistor in the thermo-time switch. The residual holding current at the prolonged-injection relay then leads to overenriching of the mixture by the start valve.

The situation is remedied by using a new relay and by modifying the wiring.

New prolonged-injection relay BMW No.: 12 63 1 269 274. The electrical circuit should be modified in accordance with the 1979 model.

To do this, remove the jumper between terminal 86 and terminal 87. Check the connections in the socket housing. Terminal 86 leads to terminal "G" on the thermo-time switch, and terminal 87 leads to the start valve.





- |                               |                          |
|-------------------------------|--------------------------|
| 1 = Relay                     | 5 = Thermo-time switch   |
| 2 = Prolonged-injection relay | 6 = Warm-up regulator    |
| 3 = Air-sensor contact        | 7 = Auxiliary-air device |
| 4 = Start valve               | 8 = Electric fuel pump   |

● BMW 320i/520i as of 1979 model

Modified diode arrangement in prolonged-injection relay. Start valve and terminal "G" of the thermo-time switch are connected separately to terminals 87 and 86 respectively of the relay.

Prolonged-injection relay BMW No. 12 63 1 269 274.



## 2.2 Bridging the safety circuit

In order to carry out testing with the engine stationary, it is necessary to bridge the safety circuit.

To do this, remove the plug from the air-flow sensor and switch on the ignition.

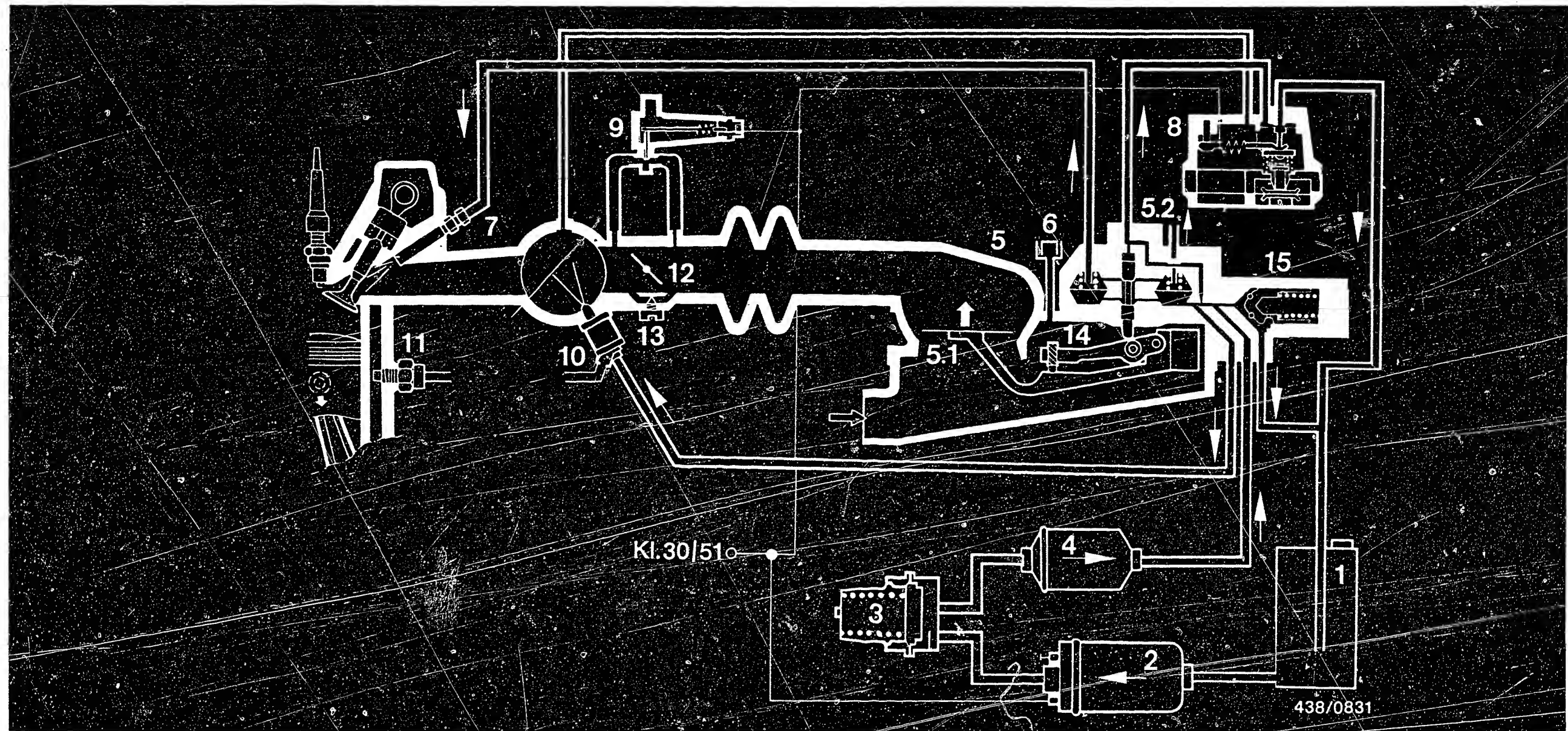
Electric fuel pump, warm-up regulator and auxiliary-air device are now supplied with battery power.

### Caution!

In the case of the electrical safety circuit in the BMW 320i/520i 1976 model the plug must also be removed from the start valve.







### 3. Diagram of fuel lines

#### ● 1976 model

- 1 = Fuel tank
- 2 = Electric fuel pump
- 3 = Fuel accumulator
- 0 438 170 001 with bleed screw

- 4 = Fuel filter
- 5 = Mixture-control unit
- 5.1 = Air-flow sensor
- 5.2 = Fuel distributor
- 6 = Anti-tamper cap
- 7 = Injection valve
- 8 = Warm-up regulator

- 9 = Auxiliary-air device
- 10 = Start valve
- 11 = Thermo-time switch
- 12 = Throttle valve
- 13 = Idle-speed screw (bypass)
- 14 = Idle-mixture-adjusting screw
- 15 = Primary-pressure regulator without push-up valve

**A12**

Diagram of fuel lines  
BMW 320i/520i 4-cylinder engine

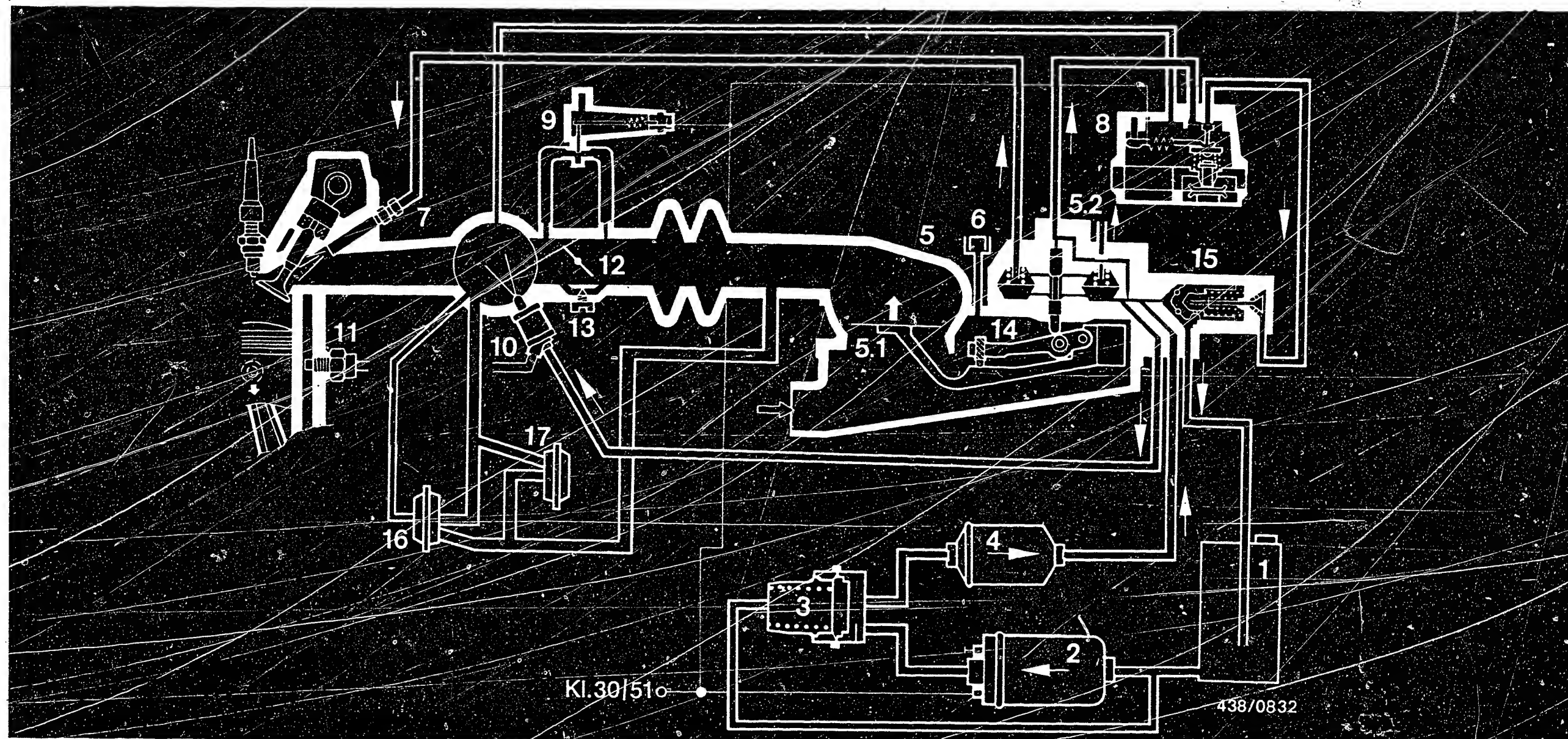


**A13**

Diagram of fuel lines  
BMW 320i/520i 4-cylinder engine







● as of 1977 model

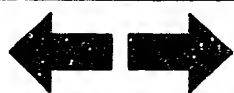
- 1 = Fuel tank
- 2 = Electric fuel pump
- 3 = Fuel accumulator
- 0 438 170 007 with leakage line

- 4 = Fuel filter
- 5 = Mixture-control unit
- 5.1 = Air-flow sensor
- 5.2 = Fuel distributor
- 6 = Anti-tamper cap
- 7 = Injection valve
- 8 = Warm-up regulator
- 9 = Auxiliary-air device

- 10 = Start valve
  - 11 = Thermo-time switch
  - 12 = Throttle valve
  - 13 = Idle-speed screw (bypass)
  - 14 = Idle-mixture-adjusting screw
  - 15 = Primary-pressure regulator with push-up valve
  - 16 = Vacuum limiter
  - 17 = Auxiliary-air valve
- } Sweden model only

**A14**

Diagram of fuel lines  
BMW 320i/520i 4-cylinder engine



**A15**

Diagram of fuel lines  
BMW 320i/520i 4-cylinder engine



## 4. General Information

### 4.1 Introduction

The vehicles BMW 320i and 520i are supplied with 4-cyl. engine with K-Jetronic in the following designs:

European models	1976...1980 models
Swedish models	1977...1980 models

This repair manual refers only to the above-mentioned vehicles and gives a concise description of the testing and adjustment operations to be performed on the vehicle on the K-Jetronic.

All the system components are dealt with in separate working steps with the corresponding test specifications. In addition to this repair manual the appropriate testing and repair manuals will, of course, be issued for every other vehicle type equipped with the K-Jetronic.

The K-Jetronic differs from other known fuel-injection systems in terms of both construction and operation. In order to be able to carry out the testing procedures described in this manual - and therefore to be able to assess the components - the K-Jetronic and its operation should be clearly understood. The essential points of the operation and construction of the K-Jetronic are described in Technical Instruction VDT-U 3/1 En.



When trouble-shooting the K-Jetronic, it is assumed that the ignition is in order and that the engine is in proper mechanical condition.

The individual test steps of this repair manual are detailed and self-contained. This permits direct trouble-shooting without having to go through the entire test program for each fault.

The trouble-shooting chart on Coordinates B 1 - B 4 is intended to make it easier to decide which test steps have to be carried out for certain faults.

According to the symptom stated by the customer or which you yourself have determined, select the possible cause in the trouble-shooting chart. The coordinate at the end of the cause column refers to the appropriate test step with the associated test specification.

Important note:

If any fuel connections are loosened, parts removed, also on the vacuum system, always use new seals when re-connecting or re-installing.

Ensure utmost cleanliness when working on the K-Jetronic. Fuel connections must be cleaned thoroughly on the outside before opening.



## 4.2 Design

The entire system of the K-Jetronic in these vehicle types corresponds, with the exception of the differences listed below to the basic design as described in Technical Instruction VDT-U 3/1 En.

## 4.3 The following components are different or extra:

- Electric fuel pump with replaceable non-return valve.
- Fuel accumulator with 20 cm<sup>3</sup> accumulator volume.

On accumulator 0 438 170 001 the spring chamber is vented to atmosphere via a screw.

On accumulator 0 438 170 007 the spring chamber is connected by a hose piece to the intake line of the electric fuel pump.

- 4-cylinder mixture-control unit with updraft air-flow sensor.
- Warm-up regulator 0 438 140 005 for intake-manifold-pressure-controlled full-load enrichment.  
Intake-manifold connection on top part of housing.
- Electrical safety circuit. The components - electric fuel pump, warm-up regulator and auxiliary-air device - are energized via a relay. This ensures that when the engine is stopped and the ignition is switched on the electric fuel pump does not start up and the warm-up regulator and auxiliary-air device do not shut off prematurely.



- Due to the so-called prolonged-injection circuit (in the 1976 model) and the prolonged-injection relay (1977...1980 models) the start valve injects during cold starting not only during the starting period, but throughout the entire switching time of the thermo-time switch.
- Fuel distributor 0 438 100 005 (in the 1976 model) without push-up valve.  
Fuel distributor 0 438 100 023 (1977...1980 model) with push-up valve for sealing the warm-up regulator return.
- Vehicles with air conditioner are equipped with a solenoid-operated air valve for stabilizing the engine speed.

#### 4.4 Other equipment

- Vehicles of the Sweden model are equipped with a vacuum limiter and auxiliary-air valve.  
The vacuum limiter opens only on the overrun, and the auxiliary-air valve only during starting. Both components must be leak-tight in all other operating conditions.

When adjusting/testing the idle speed, the influence of these additional components should be borne in mind.



## 5. Test equipment and tools.

- Pressure tester KDJE-P 100 (previously KDEP 1034).  
For testing all fuel pressures and testing for leaks.
- No additional connecting parts are required for connecting the pressure tester to the control-pressure port of the fuel distributor.
- Adjusting wrench KDEP 1035.  
For adjusting the idle-mixture-adjusting screw in the mixture-control unit (CO-adjustment).
- Guide ring KDEP 1040/10 (dia. 80 mm)  
For centering the air-flow sensor plate in the air-flow sensor.
- Tester for delivered quantity comparison KDJE-P 200 (previously KDJE 7451).  
For comparing the fuel delivered from the individual fuel-distributor outlets.
- Graduate (commercially available, capacity approx. 1.5 l)  
For measuring the delivery of the electric fuel pump.
- Electric connecting cable (test lead).  
KDJE 7450/70 for the direct connection of components to be tested, e.g. cold-start valve.
- Set of tools for the removal and fitting of idle-CO-anti-tamper device of air-flow sensor.  
(e.g. No. 131090 from the firm Cartool, Hans Schubert KG, Unterer Grasweg 88/D-8070 Ingolstadt).



- Valve tester KDJE-P 400 (previously KDJE 7452).  
For testing the injection valves.

Test media: Calibrating fluid (Shell K 30, Esso-Varsol, Shell Mineral Spirits 135) or Bosch, Part Designation VS 14942-CH  
Previously Part No. 5 973 340 650  
The Bosch calibrating fluid can be obtained in 5 l metal cans from the following supplier:  
Firma  
Oskar Gnam GmbH & Co  
D-7531 Kämpfelbach-Bilfingen

Caution:

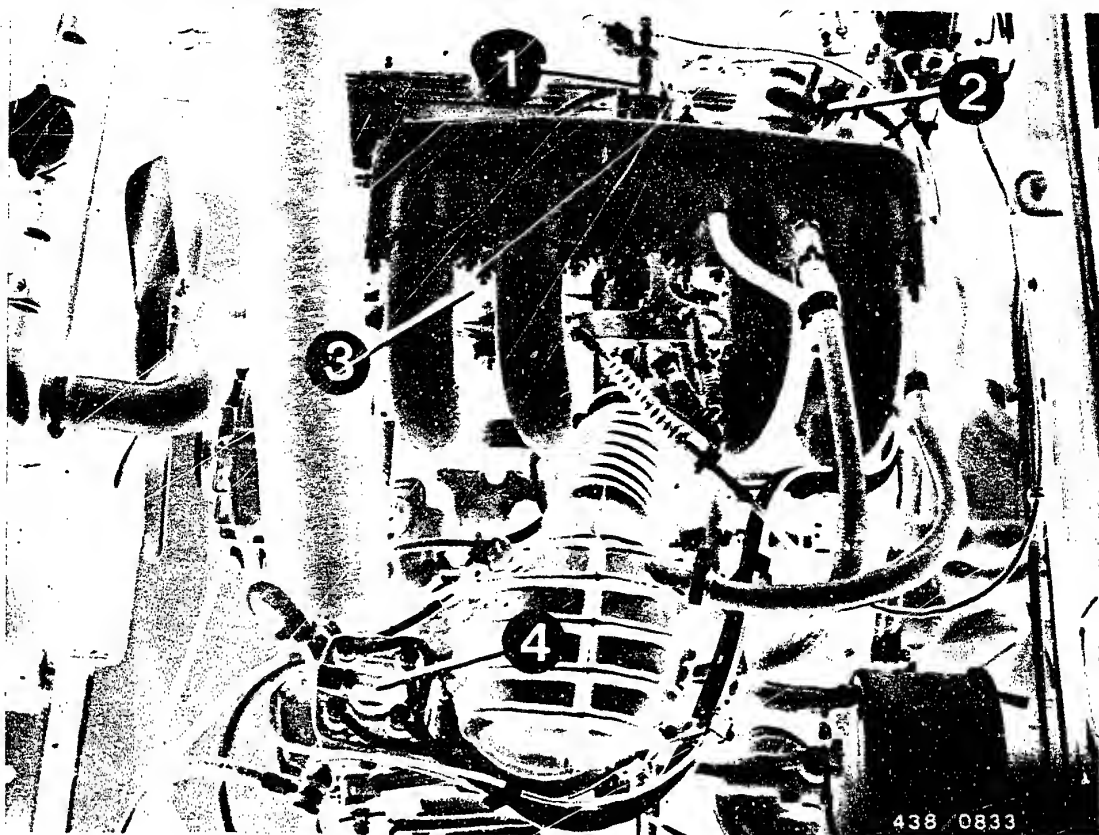
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids.

Even with calibrating fluid, be sure to observe the local official regulations.

- Tachometer (commercially available)  
For idle-speed adjustment.
- CO meter (commercially available)  
For idle-speed CO adjustment.
- Vacuum pump (commercially available)  
For testing the warm-up regulators with full-load enrichment dependent on intake-manifold pressure, e.g. the vacuum hand-operated pump from

Firma Korinth  
Ludwig-Kloos-Strasse 21  
6450 Hanau 7 (Steinheim)





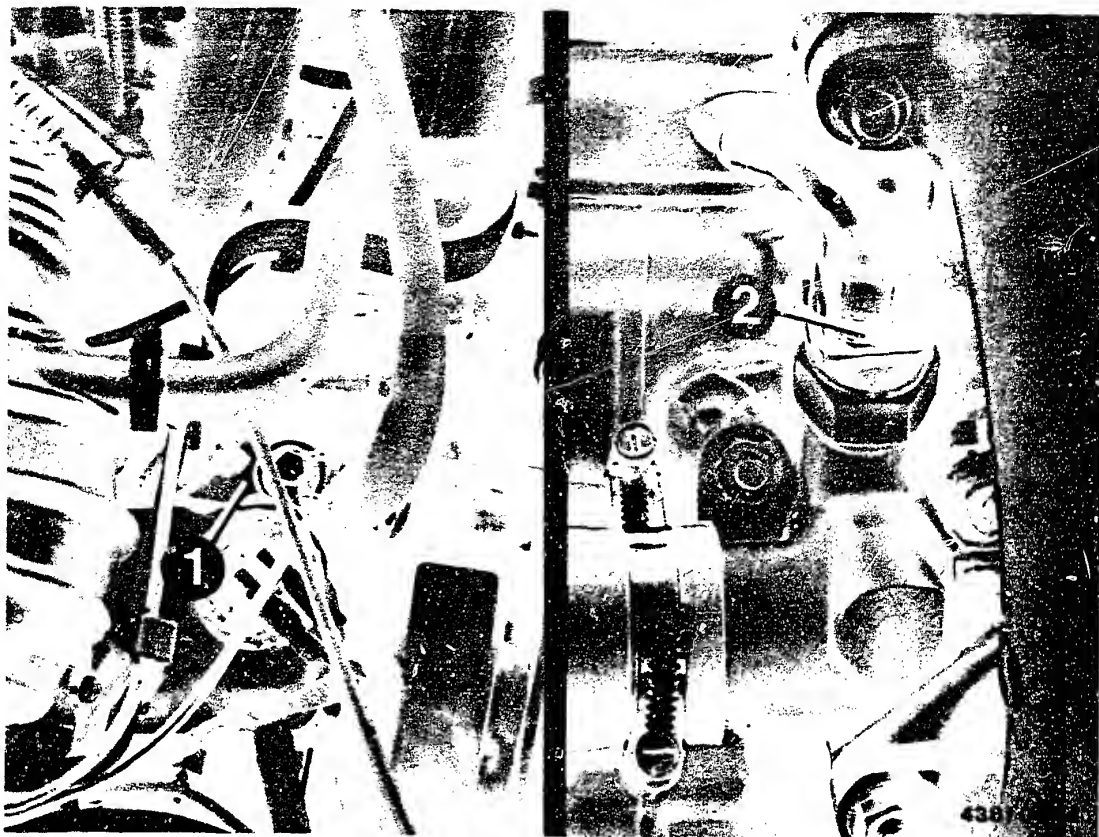
- 1 = Start valve
- 2 = Auxiliary-air device
- 3 = Injection valve
- 4 = Mixture-control unit

## 6. Installation position of individual components

### 6.1 Arrangement of components on engine





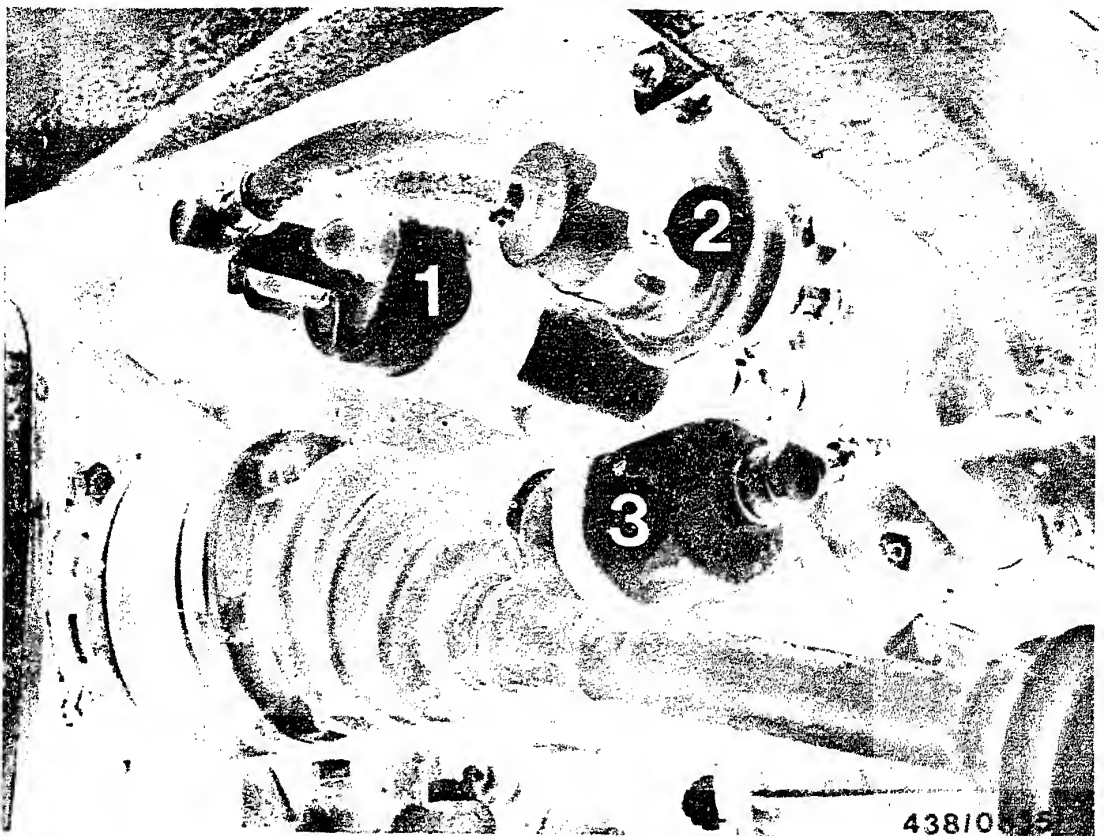


- 1 = Warm-up regulator  
2 = Thermo-time switch

**A23**

Installation position of components  
BMW 320i/520i 4-cylinder engine





- 1 = Electric fuel pump
- 2 = Fuel accumulator
- 3 = Fuel filter

## 6.2 Fuel-supply components

Electric fuel pump, fuel accumulator and fuel filter are located on a common support piece above the rear axle on the right-hand side (as viewed from behind the vehicle).

Before replacing one of these components, the connections should be thoroughly cleaned.

Before releasing the connections, pinch off intake hose of electric fuel pump so that no fuel can escape (e.g. using hose clammer W 157 of the Matra Co.).



# 7. Trouble-shooting chart (see also Coordinates (B 3/5 4)

## Customer complaint (fault symptom)

1. Engine does not start, or starts poorly, in cold condition
2. Engine does not start, or starts poorly, in warm condition\*
3. Irregular idling during the warm-up phase (shakes)
4. Irregular idling with warm engine (shakes)
5. Engine does not draw gas, burbles
6. Engine misfires when operating on the road, high load
7. Insufficient power

### \*Note:

If, in the case of Symptom 2, after checking and repairing all the fault causes listed below, the hot-start characteristic is still unsatisfactory this can be improved by fitting an impulse relay. The fitting of this relay is described in Coordinates L 6.

							Cause	Coordinates
	●	●	●	●		●	Vacuum system leaking	B 5
●	●		●	●	●	●	Air-flow sensor lever and/or control plunger not moving smoothly	B 7
	●						Position of the air-flow sensor plate incorrect	B 16
●		●					Auxiliary-air device does not open	C 1
●	●				●		Electric fuel pump not operating	C 3
●							Cold-start system defective	C 9
		●	●				Cold-start valve leaking	C 13
				●			Excessive fuel delivery for control-pressure circuit	D 3
●		●					"Cold" control pressure outside tolerance	D 1
	●		●	●	●	●	"Warm" control pressure too high (after warm-up)	D 1
			●	●		●	"Warm" control pressure too low (after warm-up)	D 1
					●	●	Primary (system) pressure outside tolerance	E 1
	●						Overall fuel system leaking	E 9
●	●	●	●		●		Injection valves leaking, opening pressure too low	F 7
●	●	●	●			●	Unequal fuel delivery (imbalance of fuel delivery)	G 1
●	●	●	●	●			Basic idle adjustment incorrect	G 14
						●	Throttle plate does not open completely	---

**B1**

Trouble-shooting chart

BMW 320i/520i 4-cylinder engine



**B2**

Trouble-shooting chart

BMW 320i/520i 4-cylinder engine



Customer complaint (fault symptom) (continued)

8. Engine runs on after being switched off ("diesels")

9. Fuel consumption too high

10. Flat spot during acceleration

11. CO concentration during idling too high

12. CO concentration during idling too low

13. Idle-speed cannot be adjusted (too high)

14. Engine starts but then immediately stops

Cause							Coordinates
		●		●			Vacuum system leaking B 5
●		●	●	●			Air-flow sensor and/or control plunger not moving smoothly B 7
●							Position of the air-flow sensor plate incorrect B 16
							Auxiliary-air device does not open C 1
					●		Auxiliary-air device does not close C 3
						●	Electric fuel pump not operating C 9
							Cold-start system defective C 13
●	●		●				Cold-start valve leaking D 3
		●				●	Excessive fuel delivery for control-pressure circuit D 1
		●				●	"Warm" control pressure too high (after warm-up) D 1
	●	●	●			●	"Warm" control pressure too low (after warm-up) D 1
		●				●	Primary (system) pressure outside tolerance E 1
							Overall fuel system leaking E 9
●							Injection valves leaking, opening pressure too low F 7
		●					Unequal fuel delivery (imbalance of fuel delivery) G 1
●	●	●	●	●			Basic idle adjustment incorrect G 14
							Throttle plate does not open completely ---

B3

Trouble-shooting chart

BMW 320i/520i 4-cylinder engine

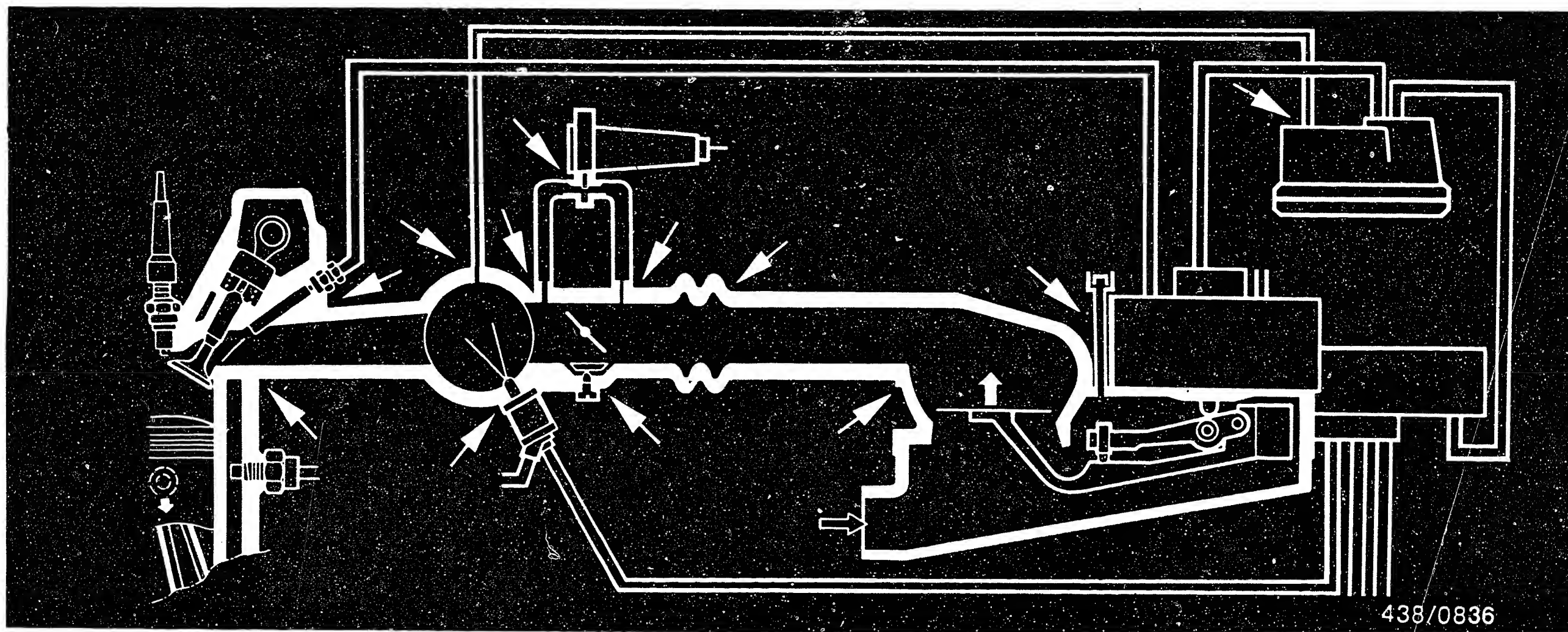


B4

Trouble-shooting chart

BMW 320i/520i 4-cylinder engine





438/0836

### Working steps

#### 8. Check the air-intake system of the engine for leaks

The arrows in the diagram show typical points where leaks can occur. Check by performing a visual inspection or, in cases of doubt, as follows:

Disconnect the hose from the outlet of the auxiliary-air device and blow air through this hose into the intake system using a compressed-air gun. The throttle valve is to be fully open. Brush connection points with soapy water, or spray with leak detector (e.g. Güpoflex). Under no circumstances may combustible liquids be used when testing for leaks.

The formation of bubbles or foam indicates a leak.

If a leak has been eliminated, it is necessary finally to adjust the idle speed with the engine at normal operating temperature:

Idle-speed adjustment is described on Coordinates G 14.

**B5**

Leak test on air-intake system  
BMW 320i/520i 4-cylinder engine



**B6**

Leak test on air-intake system  
BMW 320i/520i 4-cylinder engine



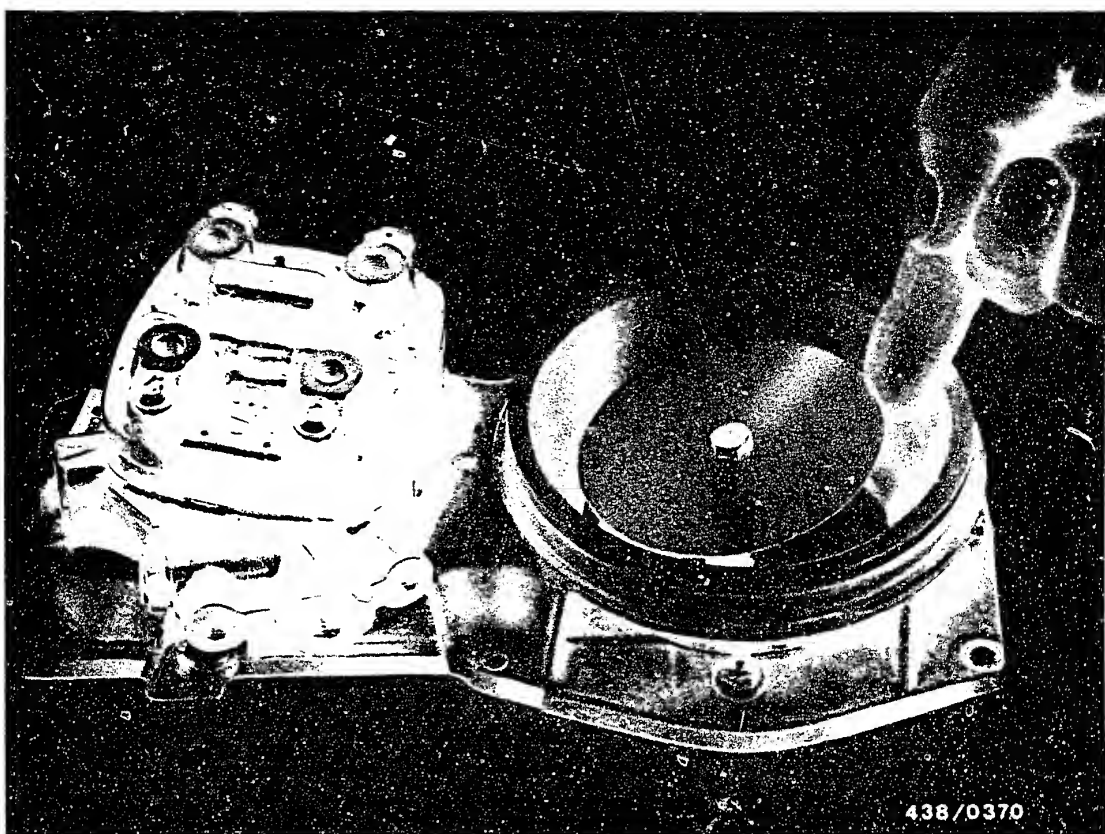


9. Check the control lever in the air-flow sensor and the control plunger in the fuel distributor for ease of movement.

#### 9.1 Preparations

- Engine temperature not below +20°C.
- Remove the rubber hood so that the air-flow sensor plate becomes accessible.
- Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.  
This results in application of the control pressure to the control plunger in the fuel distributor.





### 9.2 Check that the control lever moves freely

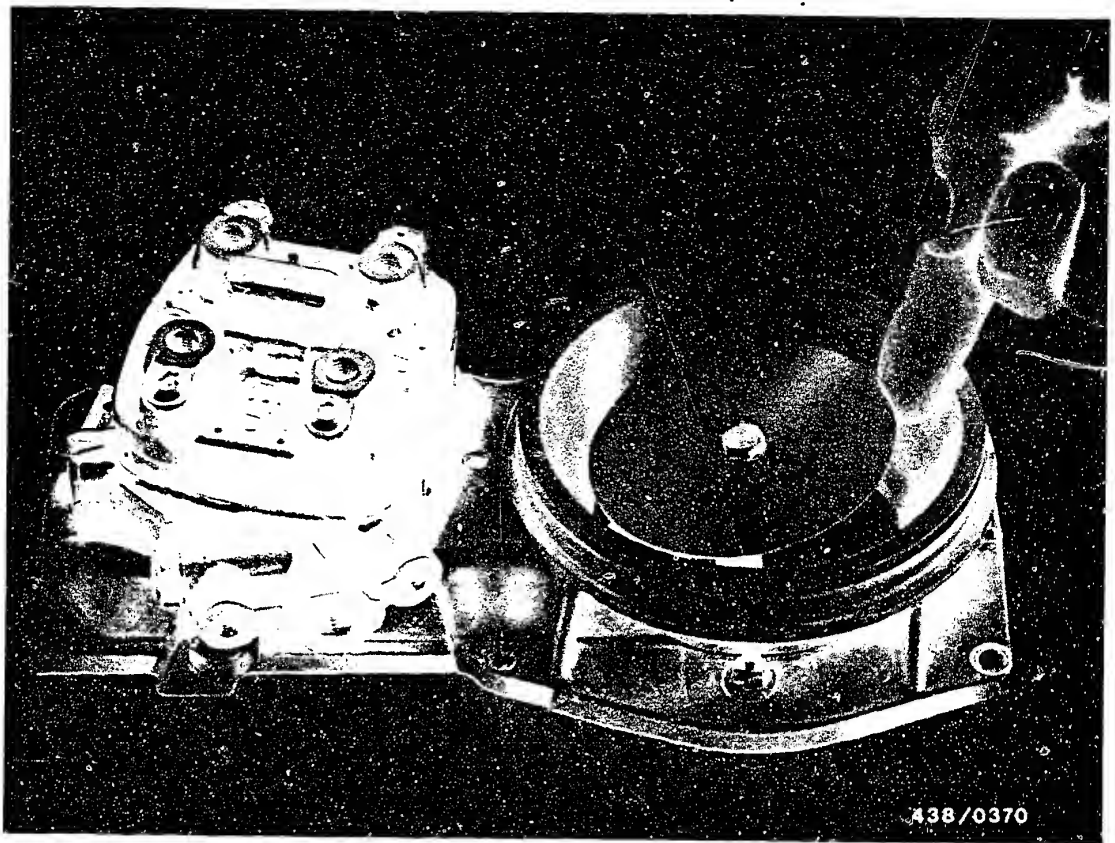
Raise the air-flow sensor plate by hand (updraft) and release again. The sensor plate snaps back into the zero position and bounces up about twice from the spring-loaded stop. If the control lever does not move freely, first release all fastening screws holding the air-flow sensor to determine whether housing deformation is the cause of the problem.

If the problem is solved by loosening the fastening screws, the seal between the air-supply housing and air-flow sensor should be changed (BMW parts).

Tighten the screws uniformly cross-wise to a torque of  $9...10 \text{ Nm}$  ( $0.9...1.0 \text{ kgfm}$ ).

If the housing is not deformed, then the air-flow sensor must be repaired or replaced.





### 9.3 Check that the control plunger moves freely

Raise the air-flow sensor plate by hand (updraft). The same resistance must be felt over the entire movement.

Move the sensor plate rapidly back to a position just in front of the zero stop. The control plunger follows only sluggishly, but must make noticeable contact with the sensor plate lever. If this condition is fulfilled, the control plunger can be considered to move freely.

If the control plunger does not move freely, remove the fuel distributor from the air-flow sensor.





## Important!

Note the following when installing fuel components and fuel lines:

Always ensure utmost cleanliness when loosening or tightening the fuel connections. No dirt must enter the fuel system.

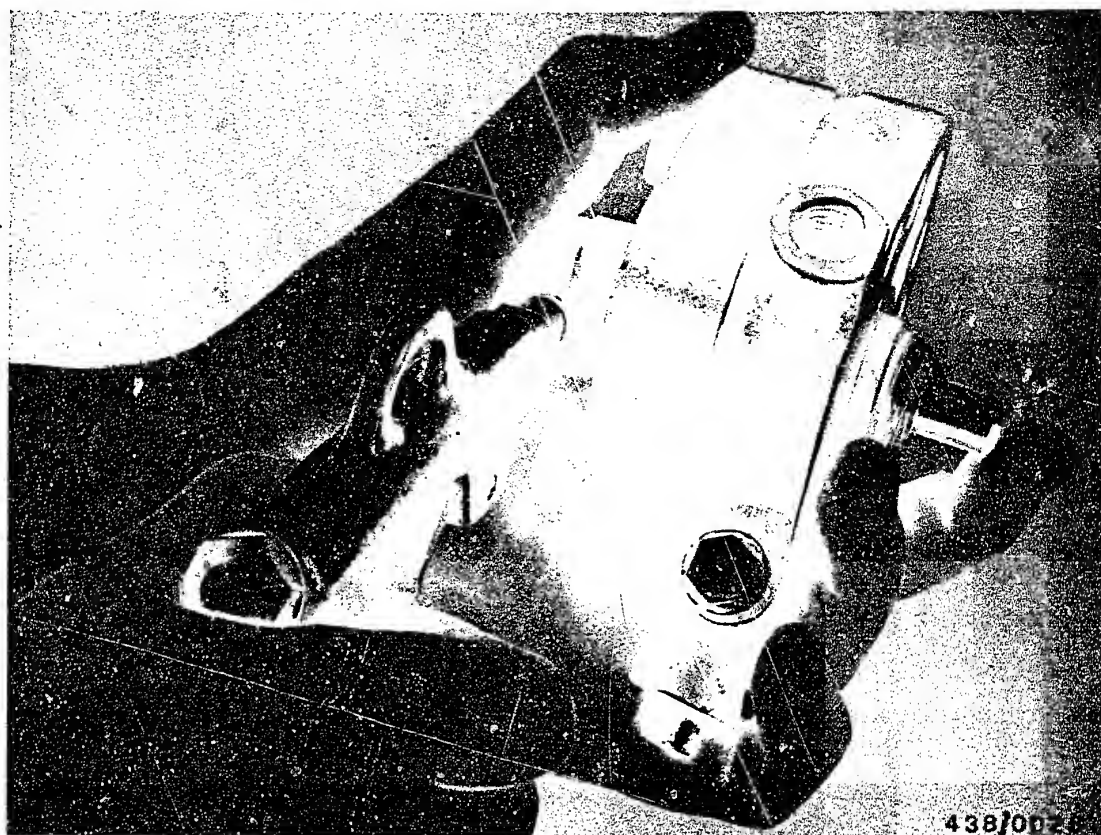
When loosening or tightening the fuel connections, apply counter-force at the fixed hexagon of the component.

Clean the fuel distributor thoroughly in the region of the fuel connections. Screw off all connections.

**B 10**

Air-flow sensor/fuel distributor  
BMW 320i/520i 4-cylinder engine





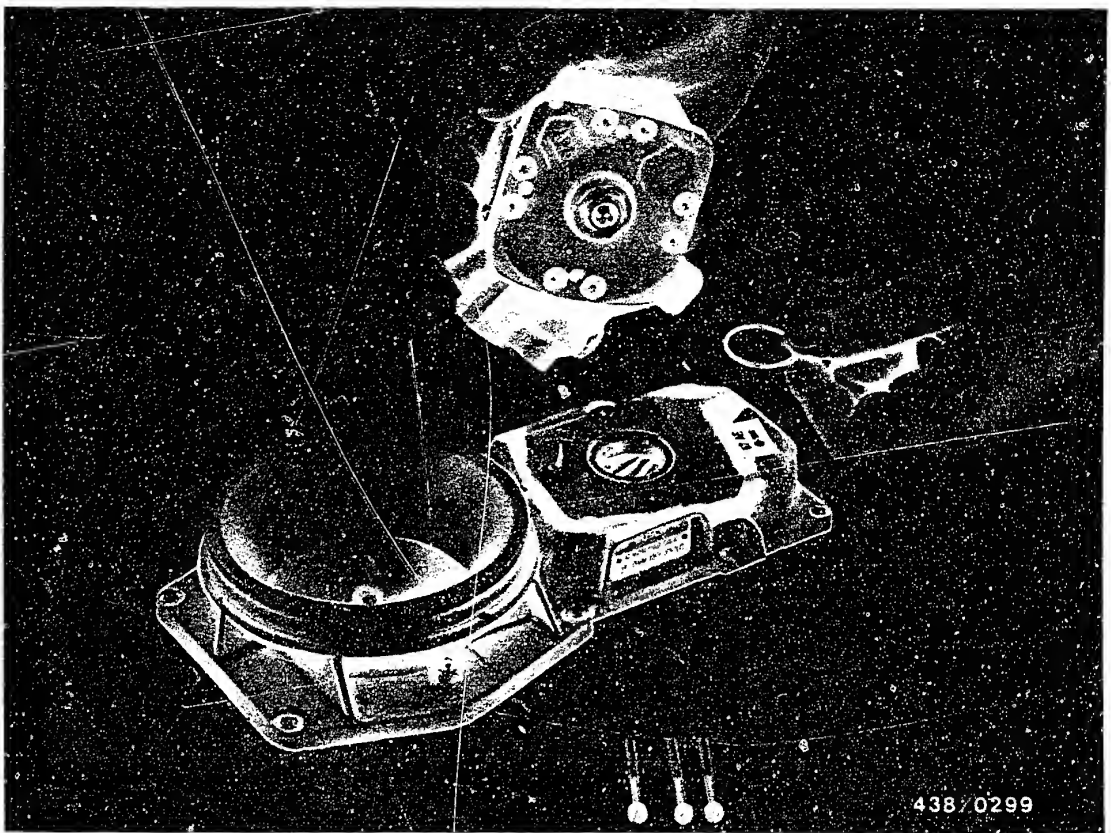
Screw out three fastening screws and remove the fuel distributor from the air-flow sensor.

Remove the plunger. Under certain conditions, in order to do this it may be necessary to blow compressed air briefly against the plunger through the control-pressure connection hole. Hold the plunger with your hand while doing this. Clean the plunger thoroughly with benzine. If the plunger still does not move freely, replace the fuel distributor

**B11**

Air-flow sensor/fuel distributor  
BMW 320i/520i 4-cylinder engine

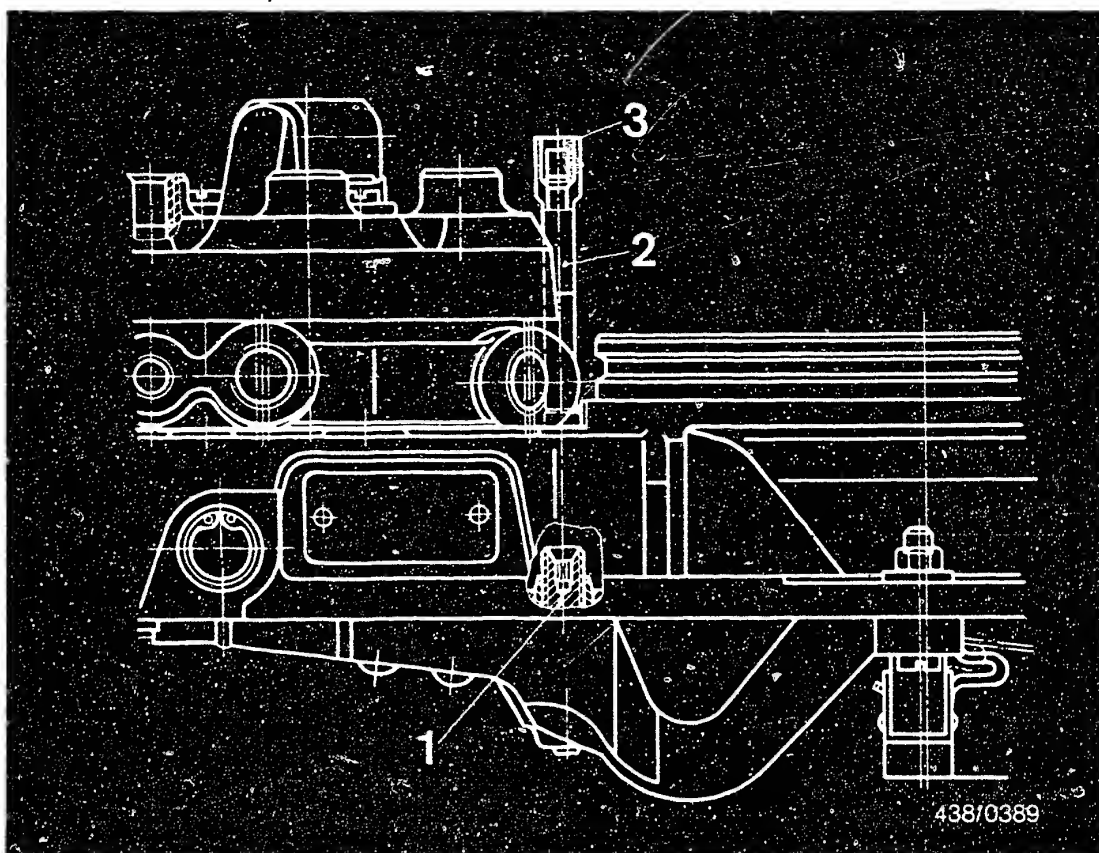




#### 9.4 Fitting the fuel distributor

When fitting the fuel distributor, use a new seal ring between fuel distributor and air-flow sensor. Observe the tightening torque 3.2...3.8 Nm (0.32... 0.38 kgfm) for the fastening screws precisely.

When connecting the fuel-injection tubing, use new seal rings.



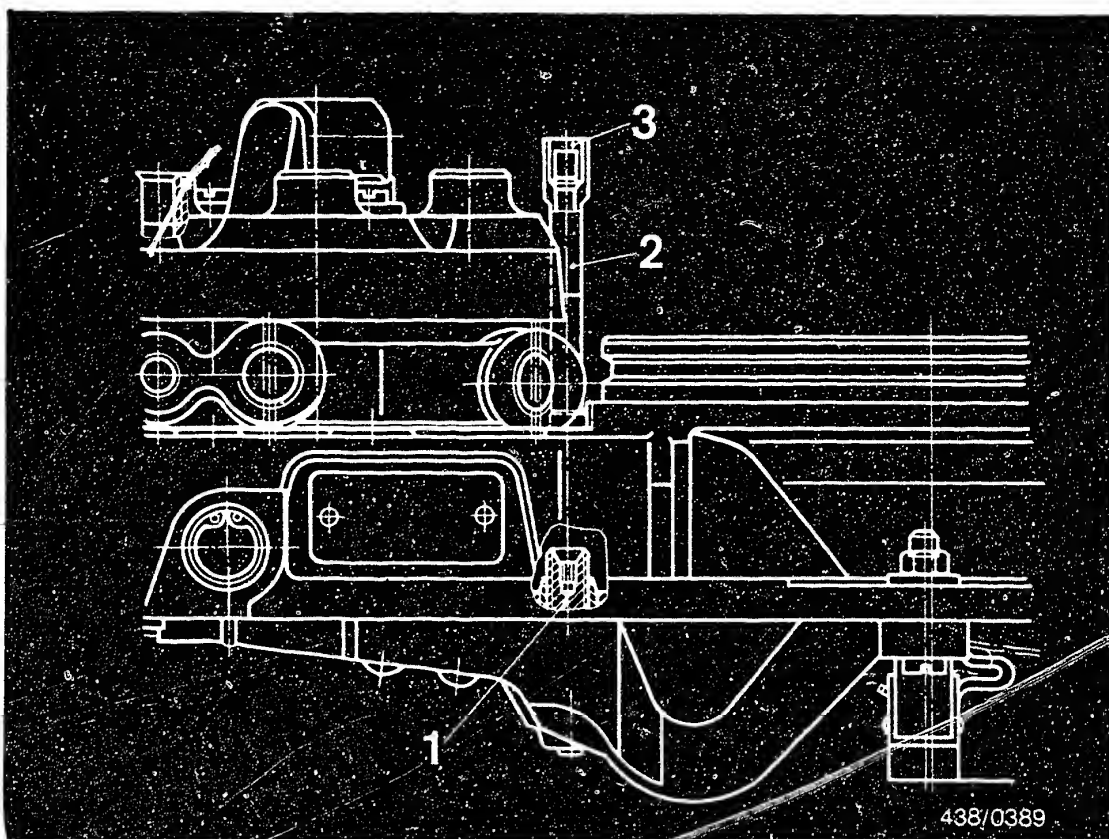
- 1 = Mixture-control screw
- 2 = Guide tube
- 3 = Lead seal

### 9.5 Matching the fuel distributor to the air-flow sensor for initial starting

Screw off one fuel-injection line from the fuel distributor.

Bridge the electrical safety circuit so that the electric fuel pump operates.

The idle-mixture-adjusting screw is adjusted via a guide tube rigidly fitted on the mixture-control unit.



438/0389

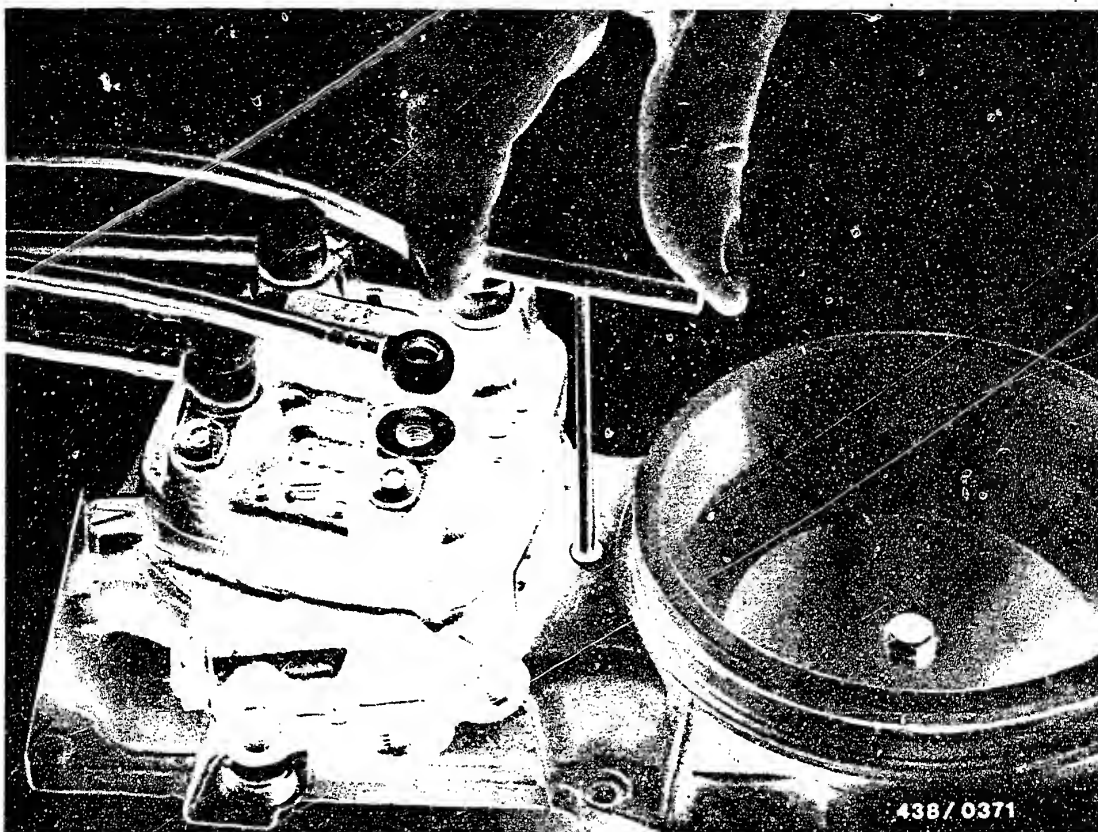
- 1 = Idle-mixture-adjusting screw
- 2 = Guide tube
- 3 = Lead seal

Remove anti-tamper device (lead seal) of the idle-mixture-adjusting screw. Introduce adjusting wrench KDEP 1035 through the hole into the idle-mixture-adjusting screw.

**B14**

Air-flow sensor/fuel distributor  
BMW 320i/520i 4-cylinder engine





Screw in the idle-mixture-adjusting screw slowly and without exerting any great pressure on the adjusting wrench until fuel is just delivered from the open outlet (arrow) of the fuel distributor. Then turn back the idle-mixture screw by 1/2 turn.

Re-connect the fuel-injection line to the fuel distributor, start the engine and warm up.

The final matching of air-flow sensor and fuel distributor is carried out by adjusting the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinates G 14.



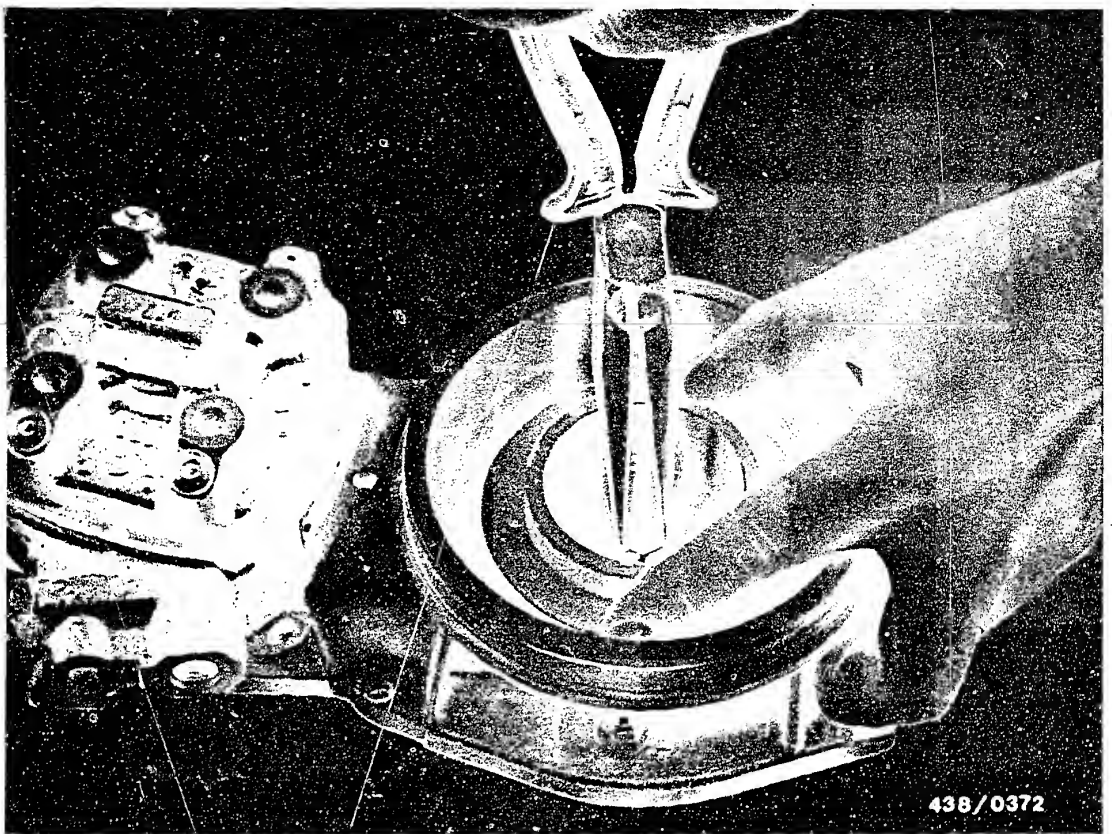
## 10. Checking and adjusting the position of the air-flow sensor plate

### 10.1 Preparations

- Engine temperature is not important.
- Remove the rubber hood fitted between the air-flow sensor and the throttle-valve assembly (release 2 clamping bands), so that the air-flow sensor plate becomes accessible.







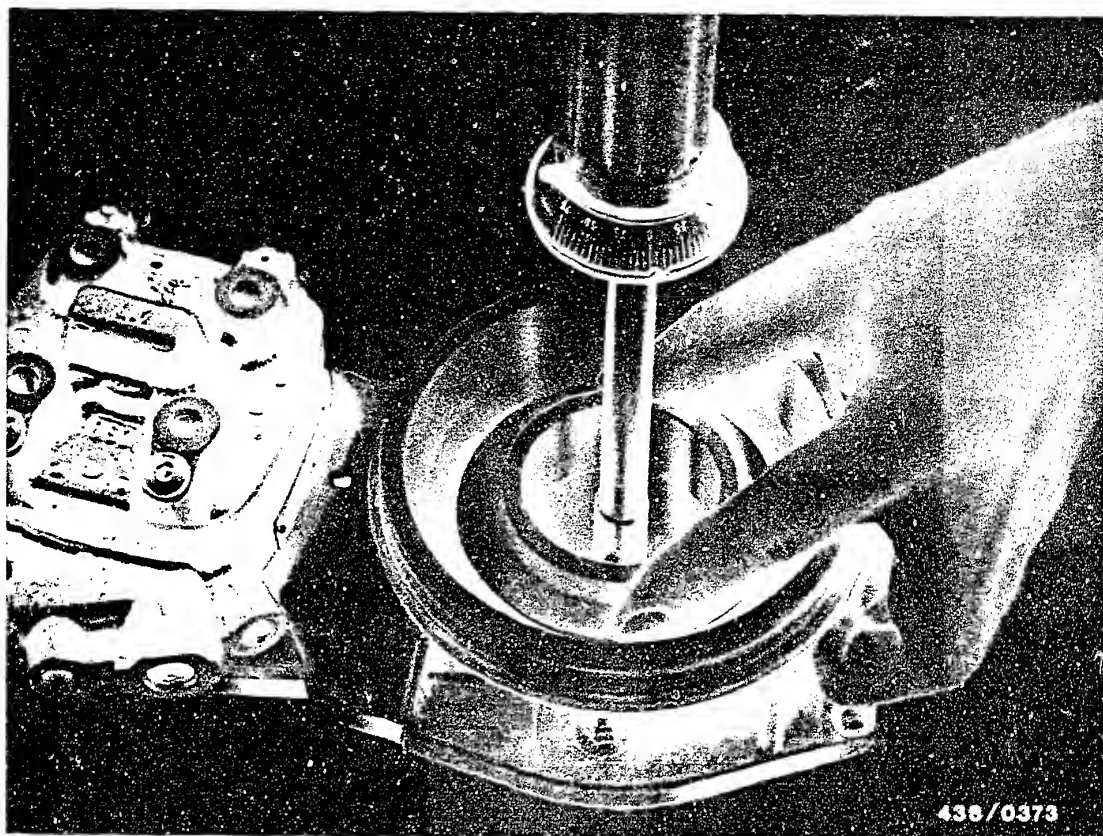
## 10.2 Centering the air-flow sensor plate

Check that the sensor plate is flat (not bent) and that it can move through the narrowest part of the air funnel without touching the funnel. If necessary, center it using a positioning ring KDEP 1040/10 (dia. 80 mm) as follows:

Loosen the sensor plate fastening screw. Insert the positioning ring while holding the fastening screw with pliers so that the sensor plate does not deflect downwards.







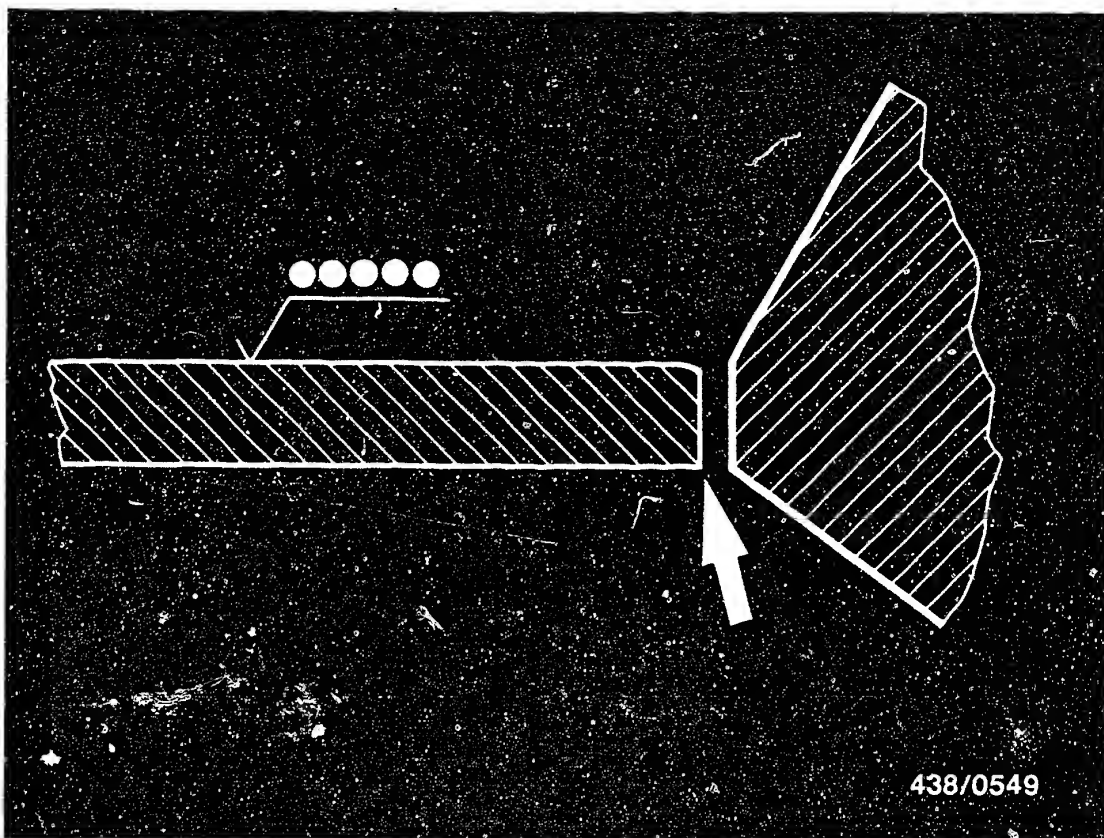
With the positioning ring in place, tighten the fastening screw with a torque of 5.0...5.5 Nm, loosen again and tighten again with the same torque. When tightening the screw make sure that the air-flow sensor plate is in its zero position (in the cylindrical part of the air funnel).

It must no longer be possible to turn the air-flow sensor plate by hand.

**B 18**

Checking/adjusting air-flow sensor plate  
BMW 320i/520i 4-cylinder engine





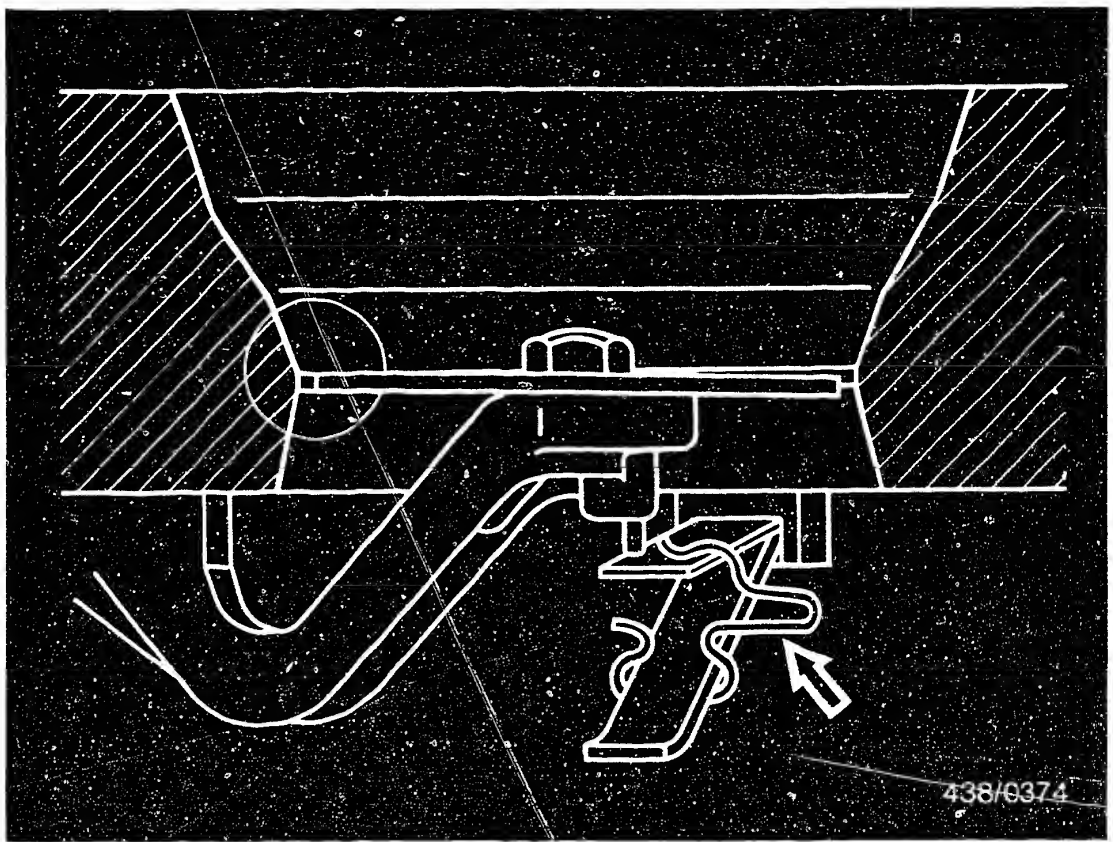
Caution:

Be sure that sensor plate is mounted in correct position! Its upper side is identified by five punch marks (in a row). The sharp edge (arrow) is at the bottom.

**B19**

Checking/adjusting air-flow sensor plate  
BMW 320i/520i 4-cylinder engine





### 10.3 Checking and adjusting the zero position of the sensor plate (rest position):

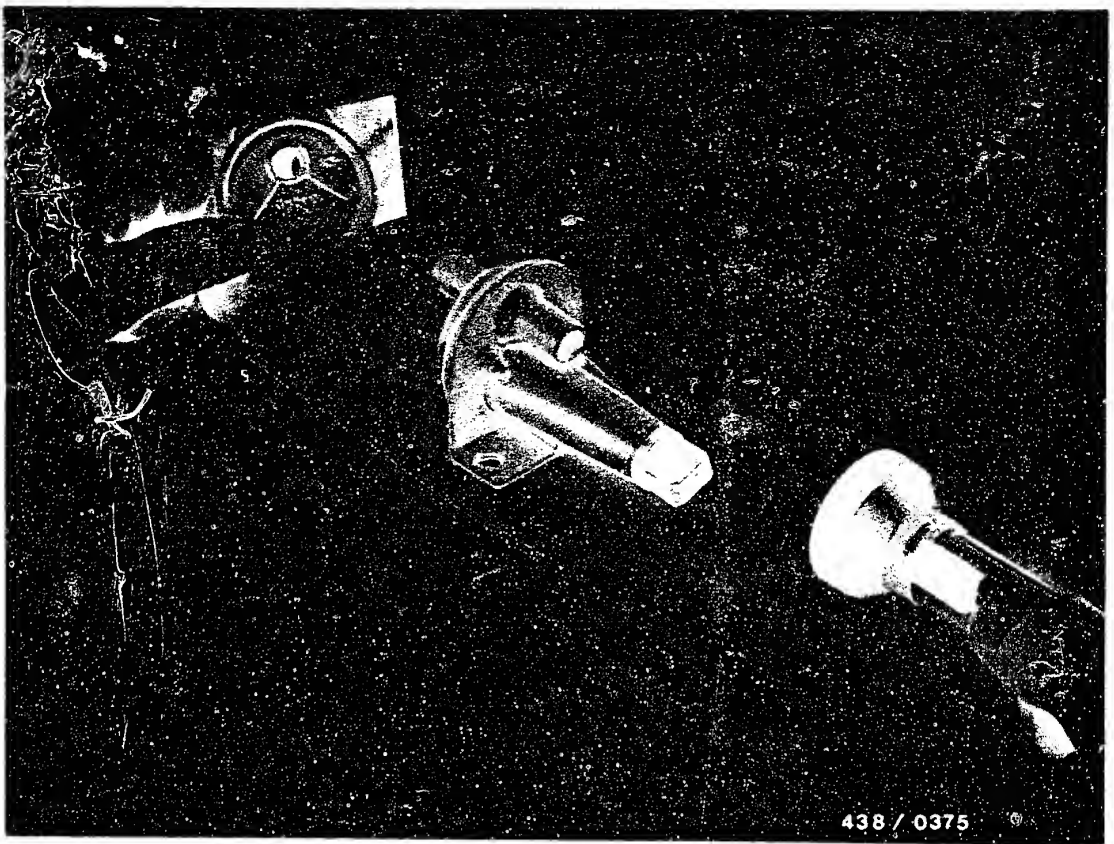
Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.

This results in application of the control pressure to the control plunger in the fuel distributor.

The upper edge of the sensor plate must be flush with the cone in the position marked with a circle in the picture. A lower position of up to maximum 0.5 mm is permissible, however the air-flow sensor plate must not project at any point on its circumference outside the cylindrical part of the air funnel.

If necessary, the position of the leaf-spring limit-stop can be corrected by adjusting the shaped spring (arrow).





- 1 = Auxiliary-air device
- 2 = Flashlight
- 3 = Mirror

#### 11. Checking the operation of the auxiliary-air device.

The engine must be cold.

Disconnect the electric cable plugs from the auxiliary-air device and warm-up regulator.

Disconnect both air hoses from the auxiliary-air device. Since the two hose fittings on the auxiliary-air device are located exactly opposite each other, a visual check can now be made to see if the blocking plate is partially open.

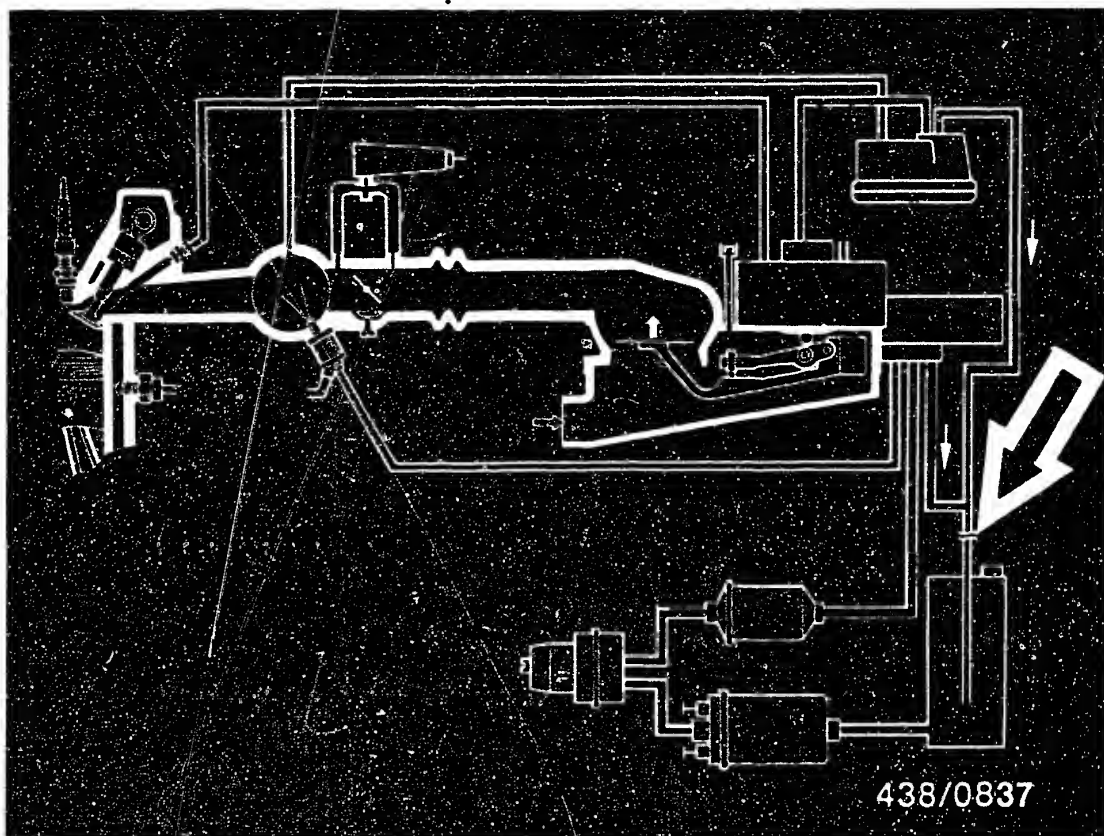
It will be easier to look through the auxiliary-air device with the aid of a flashlight and a mirror, as shown in the illustration.



- If an opening is not visible with the engine cold, replace the auxiliary-air device.
- Fit the electric cable plug on the auxiliary-air device.
- By bridging the electrical safety circuit, supply power to the auxiliary-air device.  
After a maximum of 10 minutes, the opening in the auxiliary-air device must be completely closed by the blocking plate.
- If the blocking plate does not close, check the power supply (open circuit, voltage drop).  
Minimum voltage across the connector 11.5 V with the engine stopped.
- If these points are O.K., check the heating coil of the auxiliary-air device for an open circuit using an ohmmeter.
- Replace the auxiliary-air device if defective.

When the auxiliary-air device has been replaced, readjust the idle speed with the engine at normal operating temperature. Idle adjustment is described on Coordinates G 14.





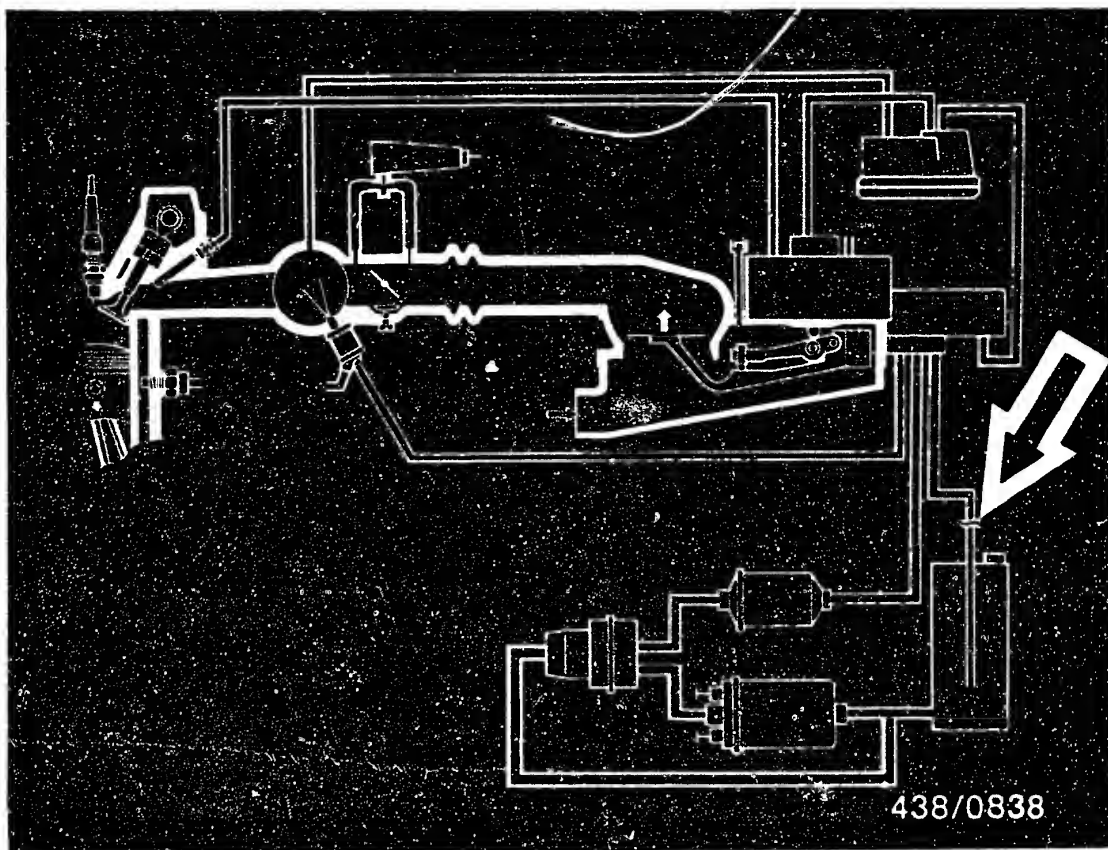
## 12. Checking the operation of the electric fuel pump

### 12.1 Requirement

Conclusive information on the operation of the electric fuel pump can only be given by a measurement of fuel delivery under pressure, i.e. under primary (system) pressure. This measurement must therefore be made at the return line leading to the fuel tank (arrow).

- Picture shows arrangement of return lines in the 1976 model (fuel distributor 0 438 100 005).

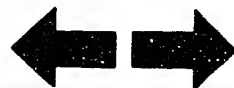




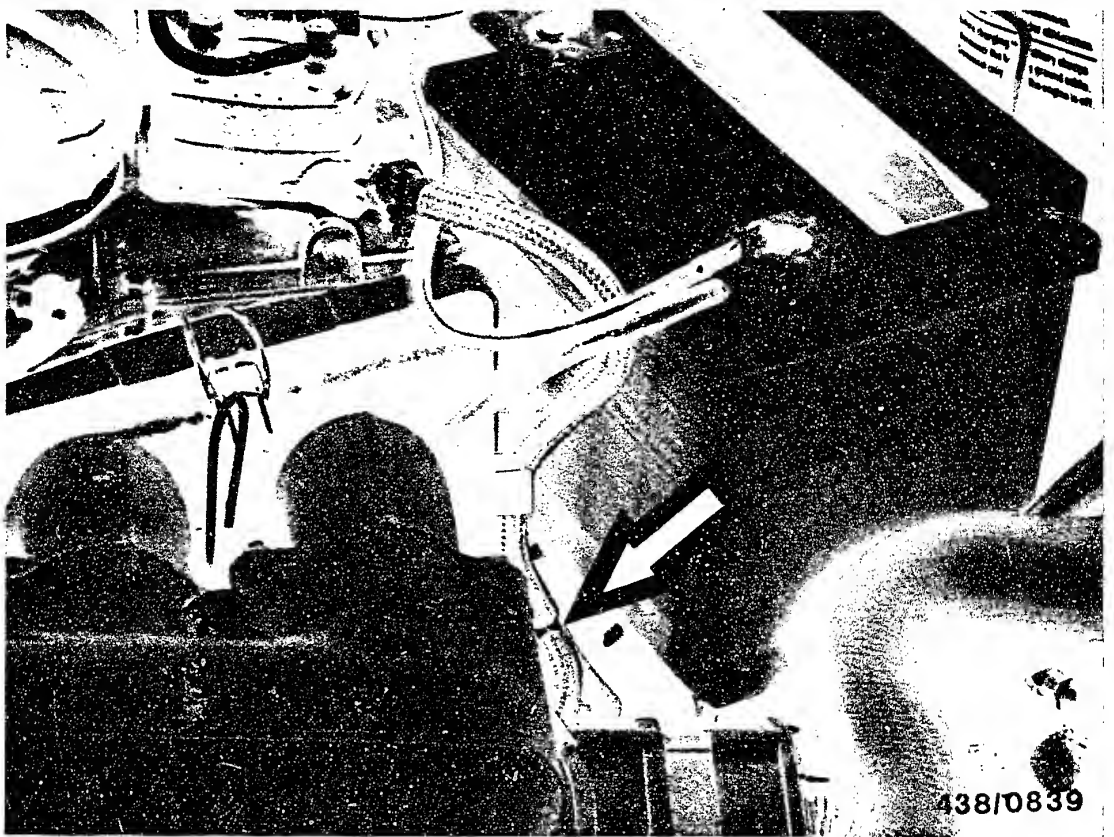
- The figure shows the arrangement of return lines from the 1977 model (fuel distributor 0 438 100 023).

**C4**

Checking electric fuel pump  
BMW 320i/520i 4-cylinder engine







### 12.2 Measuring point

A suitable measuring point for fuel-delivery testing is the return line after the T-piece.

Remove the return line on the outlet of the T-piece (arrow; partially concealed) and connect test hose to T-piece.

Hold end of hose in a graduate (approx. 1.5 litres capacity) in order to make the measurement.

- Picture shows the arrangement on the 1976 model.







- Picture shows arrangement as from the 1977 model.

A suitable measuring point for fuel-delivery testing is the return port (arrow) on the fuel distributor. Unscrew the fuel return line from the fuel distributor. Equip a test hose (minimum inside diameter 8 mm) with an inlet union and union nut M 12 x 1.5 and connect to the return port of the fuel distributor. Hold the end of the hose in a graduate (approx. 1.5 litre capacity) in order to make the measurement.



### 12.3 Checking:

Pull off the plug from the warm-up regulator and auxiliary-air device. Switch on the electric fuel pump for 30 seconds by bridging the safety circuit and collect the fuel delivered in a graduate.

### 12.4 Test specification:

Fuel delivery: at least 750 cm<sup>3</sup>/30 seconds.

### 12.5 Possible causes of insufficient fuel delivery:

- Power supply to the electric fuel pump defective, voltage drop. Minimum voltage at terminal with pump operating = 11.5 V.
- Fuel filter very dirty.

If these points are O.K., the fault lies in the electric fuel pump itself.

Replace the electric fuel pump.

### 12.6 Removal and installation of the electric fuel pump:

Pinch off the fuel intake hose from the fuel tank to the electric fuel pump (e.g. using hose clammer W 157 from Matra Co.).

When installing, use a new seal and pay attention to the correct positioning of the electric fuel pump. Danger of bending the fuel lines.



## 12.7 Problems with pump delivery under hot conditions

In very hot weather or in hot regions it may happen that vapor pockets are formed in the fuel under extreme operating conditions.

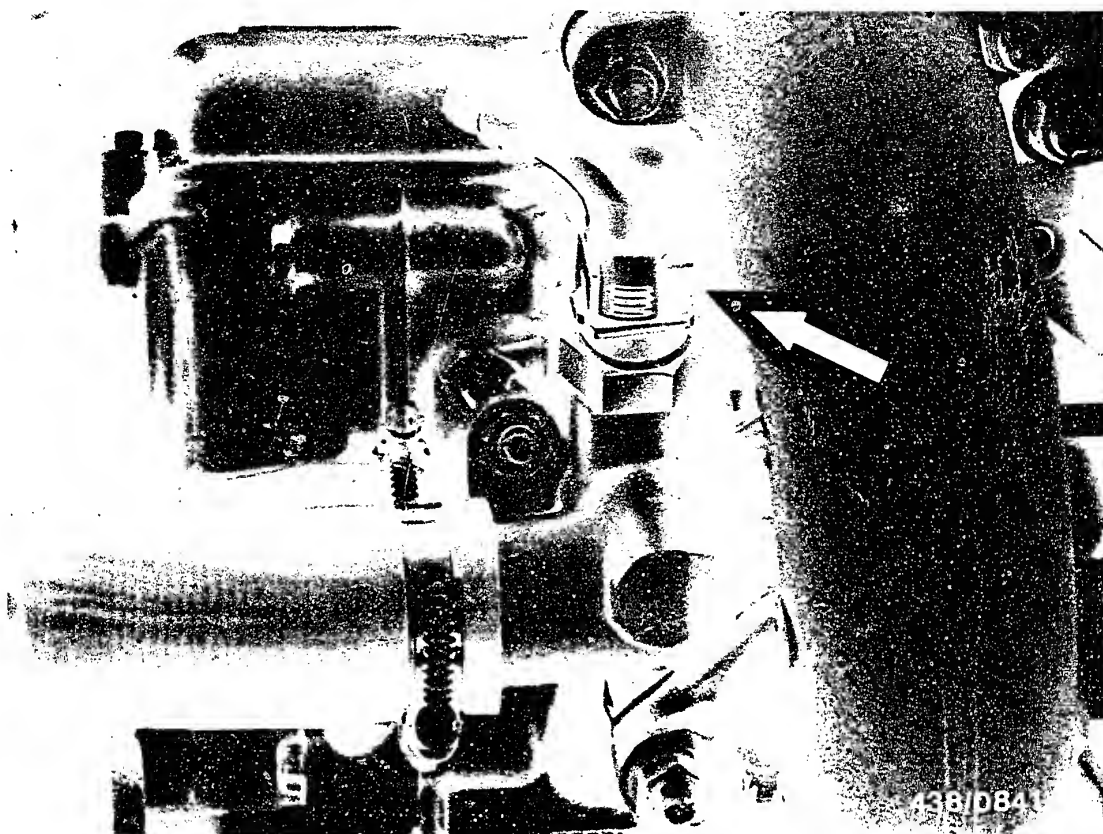
The electric fuel pump is adversely affected in its delivery and the primary pressure drops.

The pressure may drop to below the opening pressure of the injection valves. The fuel pump is very loud. As a result, the engine runs very poorly or stops.

For these extreme cases BMW has made a conversion kit to remedy the situation.

Customers with this complaint should be referred to a BMW agent.



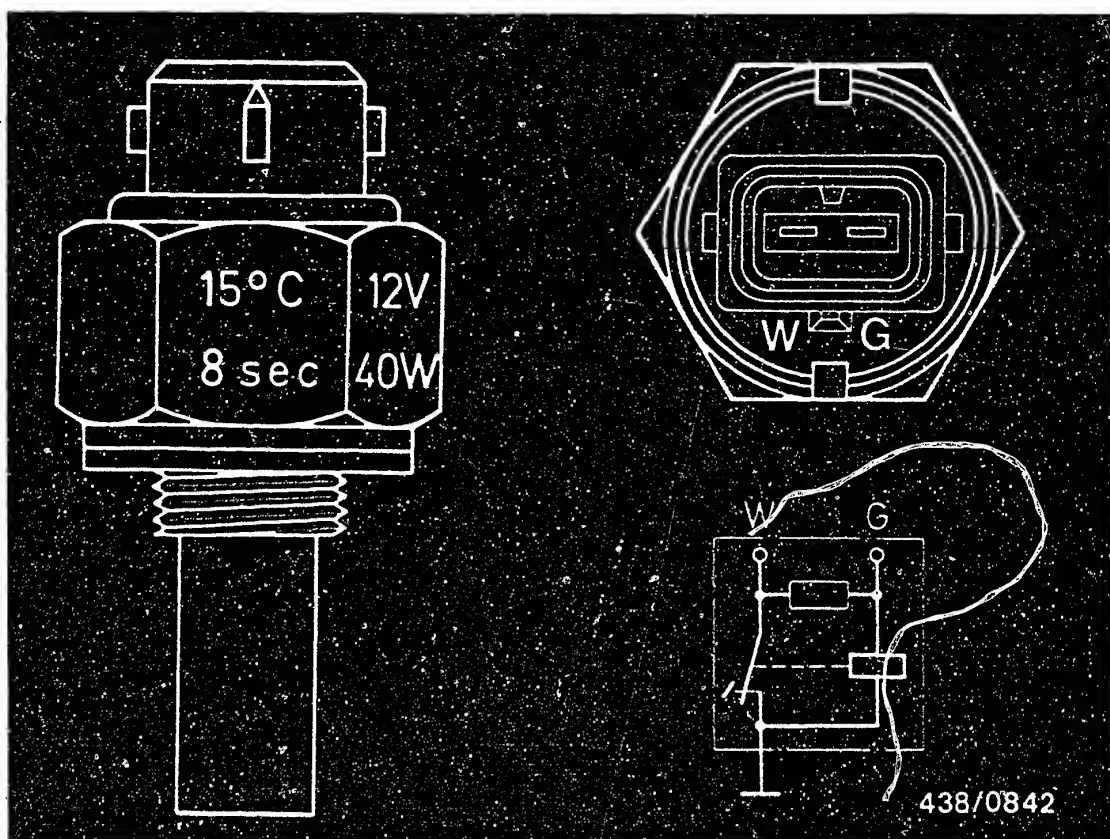


### 13. Checking the cold-start system (thermo-time switch, cold-start valve).

#### 13.1 Thermo-time switch

Remove the thermo-time switch (arrow) for testing. It is to be found on the forward end face of the cylinder head in the cooling-water distribution fitting. Collect any escaping coolant in a container.





● Thermo-time switch 0 280 130 219

The switching temperature  $+15^{\circ}\text{C}$  and the switching time at  $-20^{\circ}\text{C}$  of 8 seconds are stamped into the hexagonal section of the thermo-time switch.

The removed thermo-time switch is tested using the ohm-meter in accordance with the specifications given below. The temperatures for the thermo-time switch can easily be obtained with water. Cooling takes place in a freezer chest.

		Resistance measurement between		
at temperature below $^{\circ}\text{C}$	above $^{\circ}\text{C}$	Term. "G" and "ground" (housing)	Term. "W" and "ground" (housing)	Term. "G" and term. "W"
+ 10		50...70 $\Omega$	0 $\Omega$	50...70 $\Omega$
	+20	50...70 $\Omega$	$\infty$ $\Omega$	$\infty$ $\Omega$

● Thermo-time switch 0 280 130 214

As of chassis number

3 774 200 - BMW 320i

3 781 410 - BMW 320i RL

4 461 977 - BMW 520i

4 445 246 - BMW 520i RL

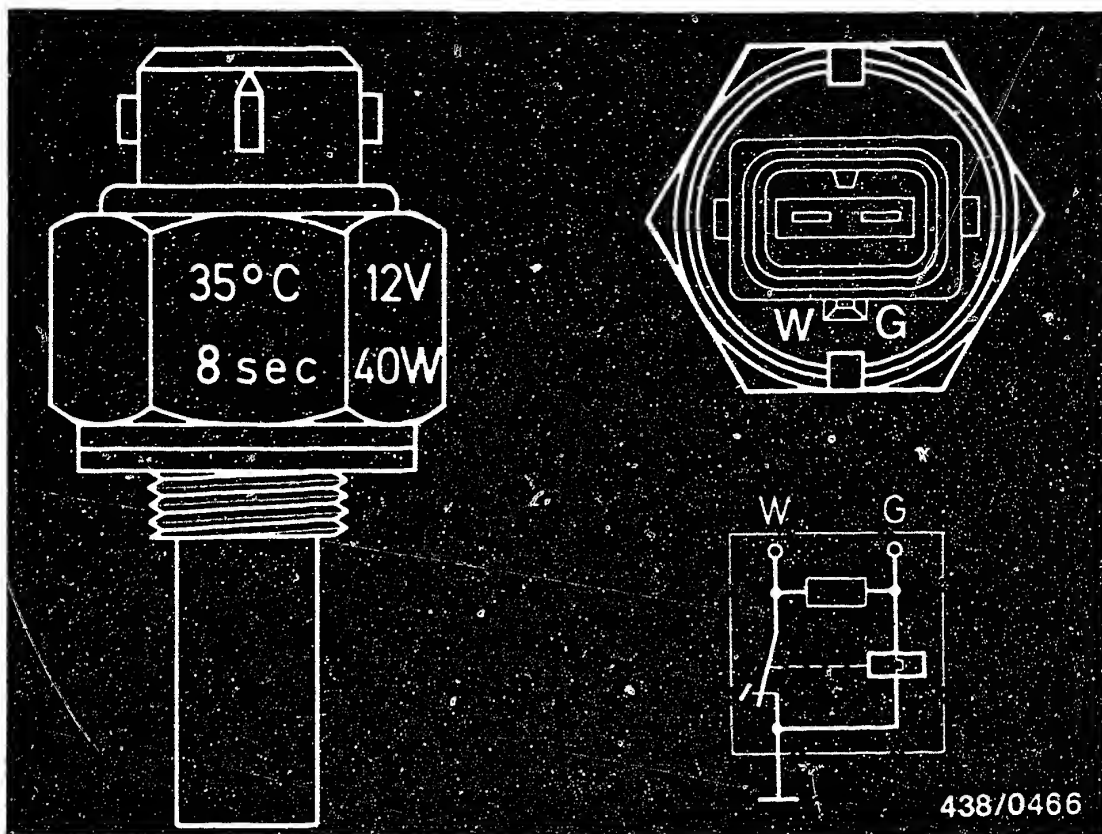
the switch-off point of the thermo-time switch has been changed from 15°C to 35°C coolant temperature.

The thermo-time switch 0 280 130 214 with 35°C can be exchanged for the switch 0 280 130 219 with 15°C.

**C11**

Checking cold-start sys./thermo-time switch  
BMW 320i/520i 4-cylinder engine





438/0466

# • Thermo-time switch 0 280 130 214

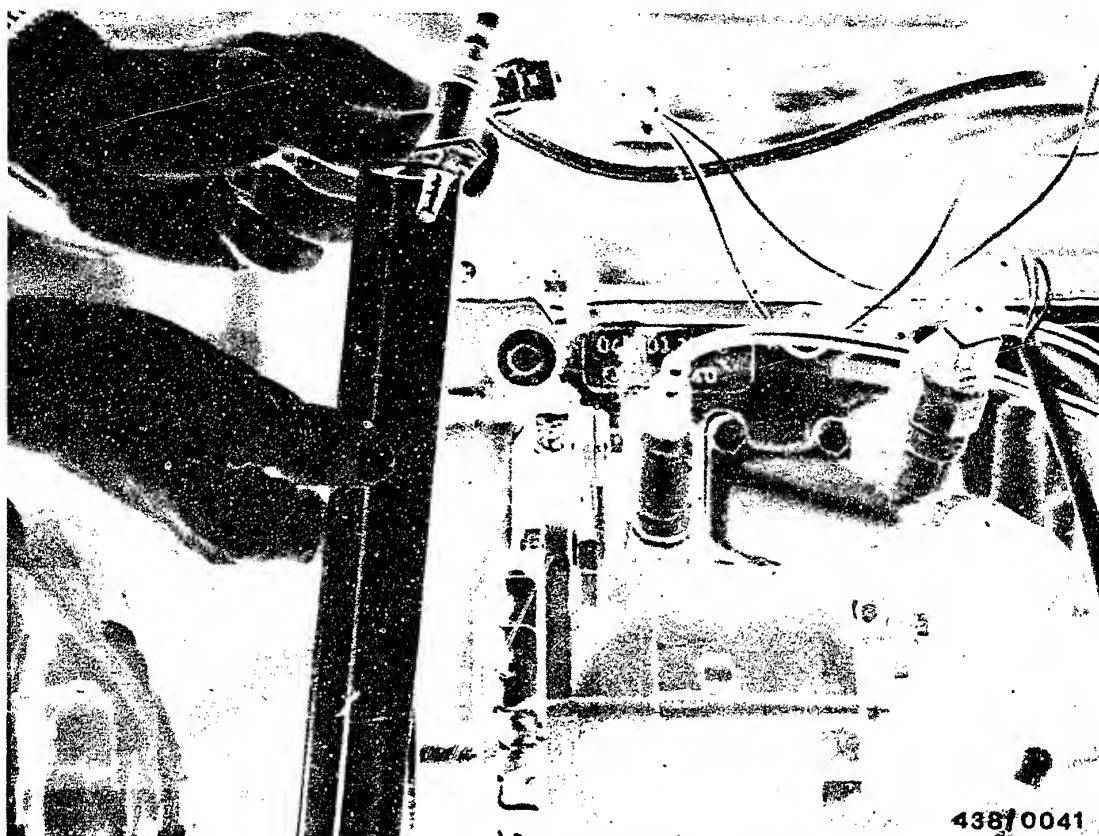
The switching temperature  $+35^{\circ}\text{C}$  and the switching time at  $-20^{\circ}\text{C}$  of 8 seconds are stamped into the hexagonal section of the thermo-time switch.

The removed thermo-time switch is tested using the ohmmeter in accordance with the specifications given below. The temperatures for the thermo-time switch can easily be obtained with water. Cooling takes place in a freezer chest.

		Resistance measurement between		
at temperature		Term. "G"	Term. "W"	Term. "G"
below	above	and "ground"	and "ground"	and term.
$^{\circ}\text{C}$	$^{\circ}\text{C}$	(housing)	(housing)	"W"
+30		25...40 $\Omega$	0 $\Omega$	25...40 $\Omega$
	+40	50...80 $\Omega$	100...160 $\Omega$	50...80 $\Omega$







### 13.2 Start valve:

Remove the start valve. Hose line remains connected. Pull off the plug and connect the start valve directly to ground and to terminal 15 (e.g. at the ignition coil) using connecting cable KDJE 7450/70.

#### Important note:

During this test, do not let the connecting cable touch B +. Danger of fire due to sparking!

Hold the start valve in a suitable container (e.g. the graduate).

Switch on the electric fuel pump by bridging the safety circuit.

Switch on the ignition (max. 30 seconds). The start valve must now open and spray fuel.



Switch off the ignition, remove the electric connecting cable and dry the nozzle of the start valve.

The safety circuit remains bridged so that the primary pressure is applied to the start valve.

No droplets of fuel must drip from the nozzle of the start valve during the next minute. Even if shaken and knocked, the start valve must not leak.

Then switch the electric fuel pump off again.

Replace the start valve if it does not open or if it leaks.

If a leaky start valve or a defective thermo-time switch has been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinates G 14.

**C14**

Checking cold-start sys./start valve

BMW 320i/520i 4-cylinder engine



### 13.3 Delayed cold starting

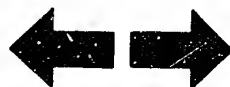
On the 320i and 520i models some customers complain of cold starting problems. The cause may be that the quantity of fuel injected is too much during cold starting.

The situation can be remedied by equipping the K-Jetronic system with an expansion tank 0 438 170 012 which has the appearance of a fuel accumulator.

- Parts required for 320i:    Expansion tank  
  0 438 170 012

#### BMW parts:

Qty.	Description	BMW Part Number
3	Hexagon bolts M 6x16	07 119 913 466
1	Spring washer B 6	07 119 932 072
1	Fuel line	13 311 265 284
1	Fuel line	13 311 265 285
1	Hose clamp A 10	07 129 952 010
1	Bracket	13 311 265 293
1	Fuel hose 5x9 (by the meter)	16 121 107 930



## Installation

Remove the battery.

Remove the fuel hose between fuel filter and fuel distributor. Cut the fuel hose (5x9) to 360 mm length and fasten to the bleed fitting of the expansion tank using the hose clamp. Fit the new fuel lines on the expansion tank. Straight line to the centre connection.

Mount the expansion tank under the battery tray. Looking from above, the two new fuel hoses are visible. The angled hose points toward the engine.

Fit the new fuel hoses on fuel filter and fuel distributor. Allow the hose end of the bleed line to hang through the recess in the front cross-member.

Install the battery.



● Parts required for 520i:

Expansion tank 0 438 170 012

BMW parts:

Qty.	Description	BMW Part Number
1	Holding plate	13 311 265 310
2	Hexagon bolts M 6x16	07 119 913 466
4	Spring washers B 6	07 119 932 072
1	Fuel line	13 311 265 305
1	Inlet-union screw	32 411 117 181
2	Seal rings	07 119 963 201
1	Fuel line	13 311 265 304
1	Hose clamp A 10	07 129 952 010
1	Fuel hose 5x9 (by the meter)	16 121 107 930



## Installation

Remove the fuel hose between fuel distributor and main fuel filter. Cut the fuel hose (5x9) to 600 mm length and fasten to the bleed fitting of the expansion tank using the hose clamp. Mount new fuel lines and holding plate on the expansion tank. Short fuel line to the centre connection. Fasten the expansion tank to the left-hand McPherson strut mounting at the top to the bolt nearest the engine. Fit new fuel hoses on filter and fuel distributor. Fasten bleed line with hose clip to coupling hose.

## Warranty

If this conversion is necessary during the warranty period, refer the customer to a BMW agent. After the warranty period the conversion is subject to payment.



### 13.4 Cold-starting problems

In addition to the installation of an expansion tank (Section 13.3) it is possible to install a prolonged-injection relay with wiring harness to remedy the problems of cold starting.

#### Parts required

Thermo-time switch 0 280 130 219 and for USA ... 214.

#### BMW parts:

Qty.	Description	BMW Part Number
1	Wiring harness	61 12 1 363 201
1	Relay	61 31 1 362 224
3	Cable strap	61 13 1 354 082

#### Installation

Lay the wiring harness with relay as shown in the circuit diagram. Fasten the new wiring harness with cable straps to the existing engine wiring harness. Remove the two plugs, start valve tap and thermo-time switch tap, insulate and bind to wiring harness. Fit the relay with a base to the central electrics (fuse and relay box) above the relay for the fuel pump. Due to the previous constant current loading, it is advisable to replace the thermo-time switch.

As of chassis number

3 762 945 - BMW 320i

3 780 288 - BMW 320i RL

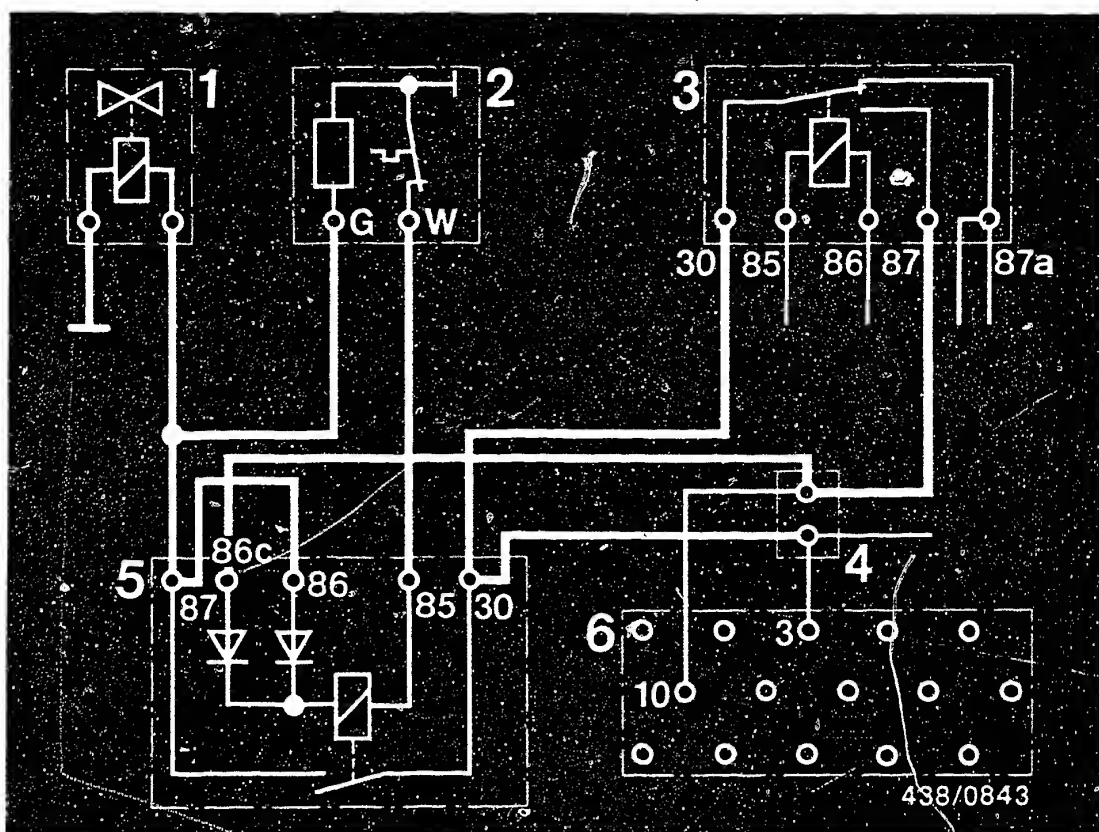
4 454 662 - BMW 520i

4 440 456 - BMW 520i RL

this modification is performed as standard during production.







- 1 = Start valve
- 2 = Thermo-time switch
- 3 = Relay
- 4 = Plug-in connection
- 5 = Relay
- 6 = Engine plug

#### Warranty

If this conversion is necessary during the warranty period, refer the customer to a BMW agent. After the warranty period the conversion is subject to payment.



## 14. Checking the control pressures

### 14.1 Preliminary remarks:

The control pressures tested in the following are in each case governed by the warm-up regulator. If the test results are incorrect, however, this may also be due to faults which have nothing to do with the warm-up regulator.

These possible faults are:

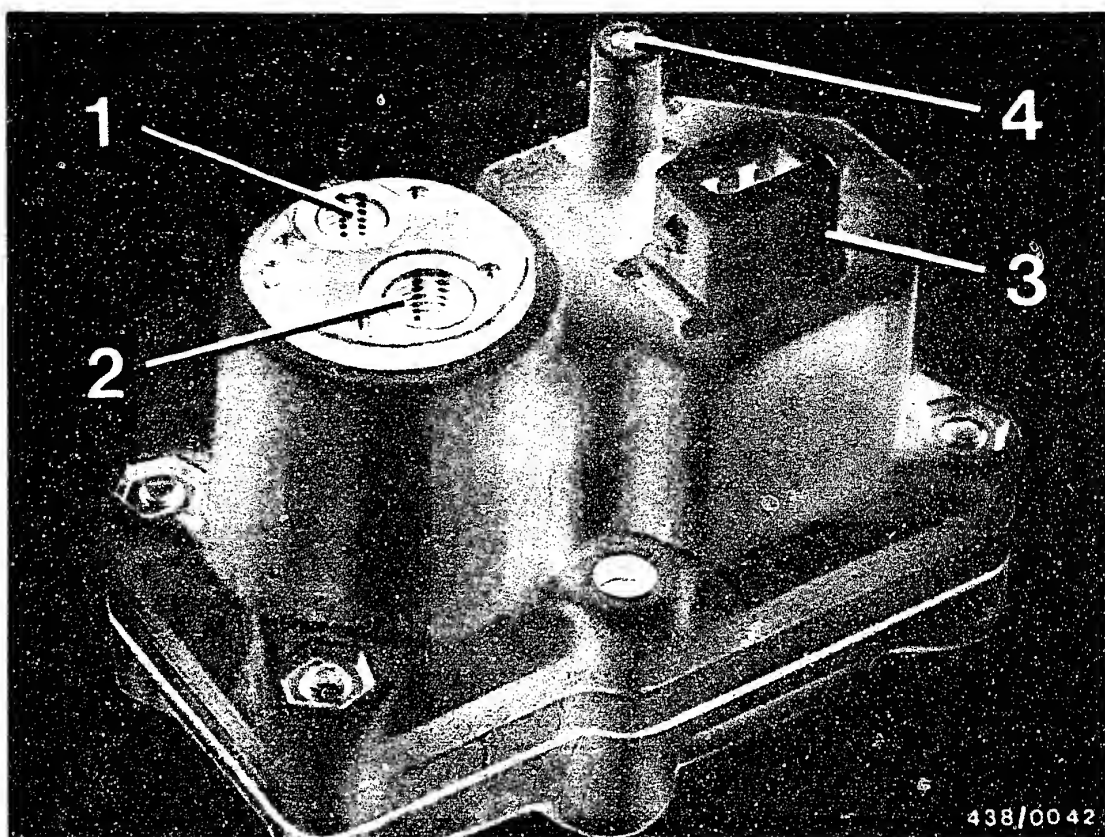
- No or too low a voltage at the electric connector.
- Fuel return from the warm-up regulator blocked or constricted.
- Too high a fuel delivery for the control-pressure circuit.

The testing of this control-pressure delivery is described as an additional test step at the beginning of the control pressure tests.

Test specification: 160...240 cm<sup>3</sup>/min.

Reference is made to the other possible causes of trouble in the respective test step.



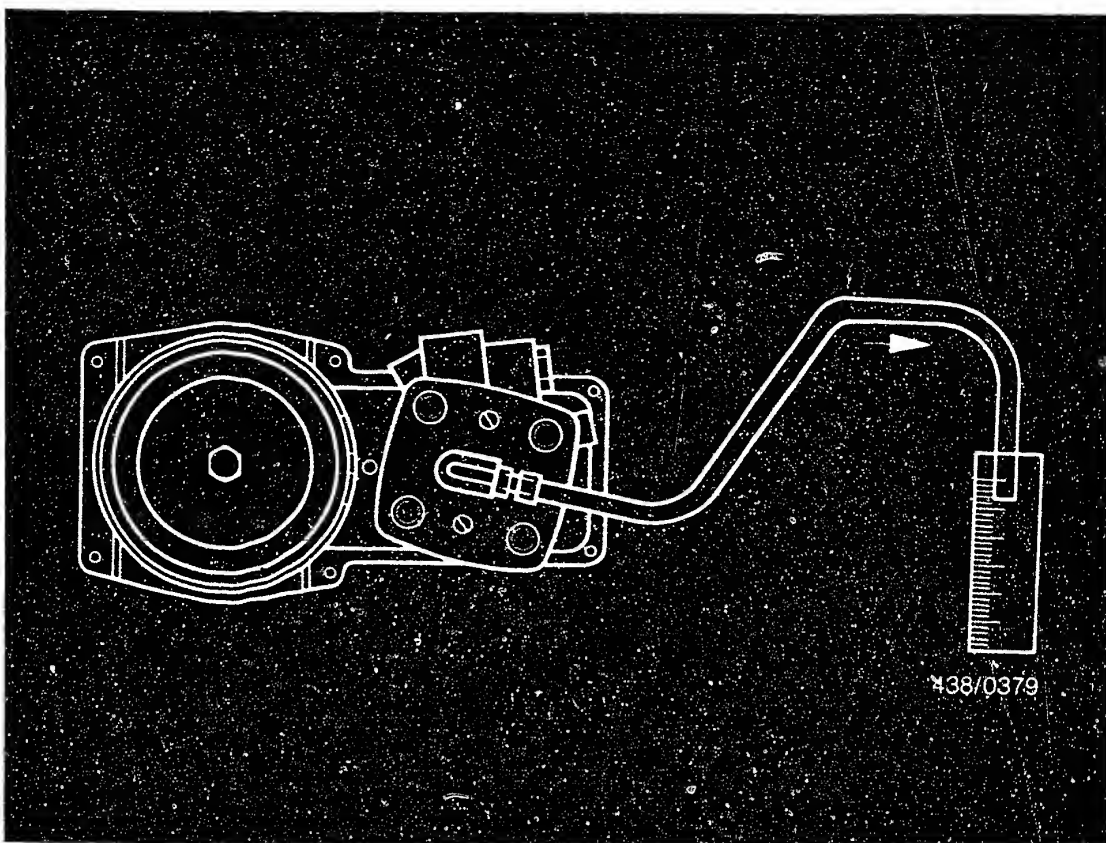


- 1 = Return connection (M 8 x 1)
- 2 = Inlet connection (M 10 x 1)
- 3 = Connection for intake-manifold pressure (downstream of throttle valve)
- 4 = Electric connection

#### 14.2 Warm-up regulator versions

##### ● Warm-up regulator No. 0 438 140 005

The warm-up regulator is a version for intake-manifold-pressure-controlled full-load enrichment. This means that the cold and warm control pressures are additionally influenced by the intake-manifold pressure acting on the full-load diaphragm of the warm-up regulator. The intake-manifold connection port (3) is on the top of the housing cover.



### 14.3 Checking the fuel delivery for the control-pressure circuit:

Before testing: Make sure that the electric fuel pump is operating properly. Test specification: min.  $750 \text{ cm}^3/30 \text{ s}$ .

Unscrew the control-pressure line (to the warm-up regulator) from the fuel distributor.

Connect one of the two connecting hoses of the pressure tester KDJE P 100 (previously KDEP 1034) to the connecting piece on the fuel distributor (thread M12x1.5) and hold hose in graduate (approx. 0.5 litre capacity).

Switch on the electric fuel pump for 1 minute precisely by bridging the safety circuit. Measure delivery.

Test specification: 160...240 cm<sup>3</sup>/min.

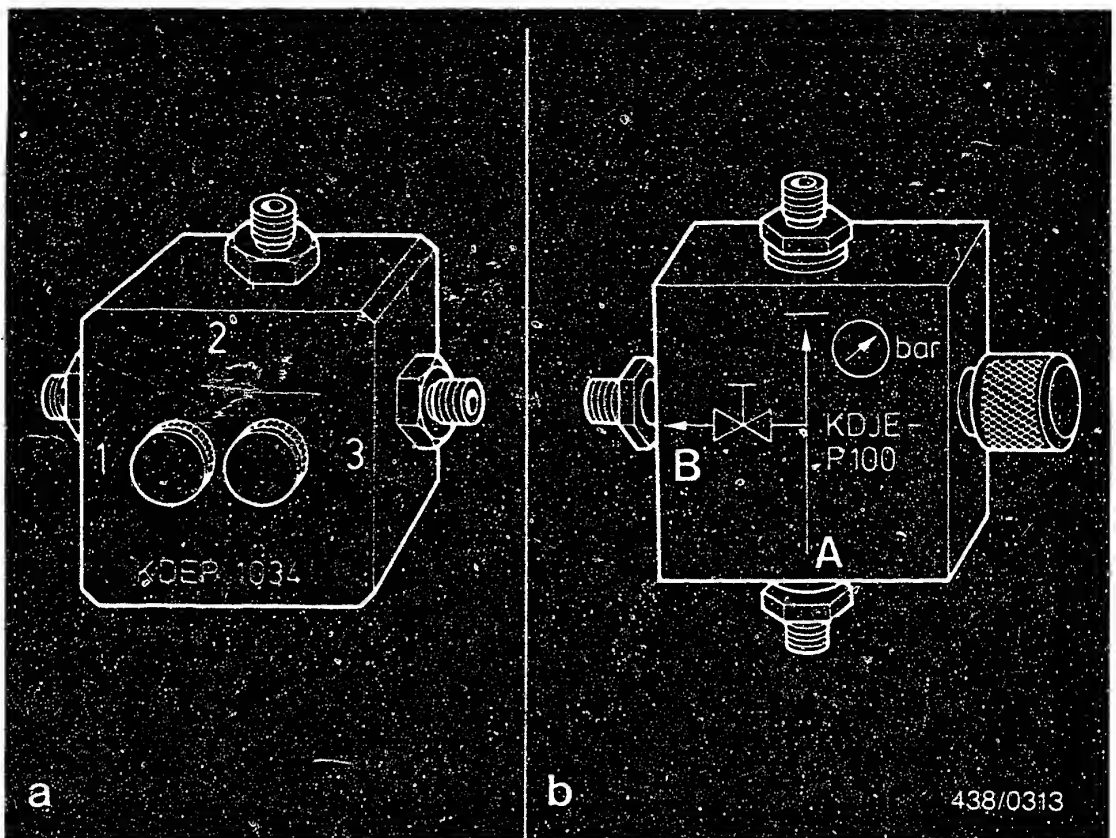
If the measured value is outside tolerance, the fault is in the fuel distributor.

Replace the fuel distributor.

**D4**

Checking the control pressures  
BMW 320i/520i 4-cylinder engine





#### 14.4 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

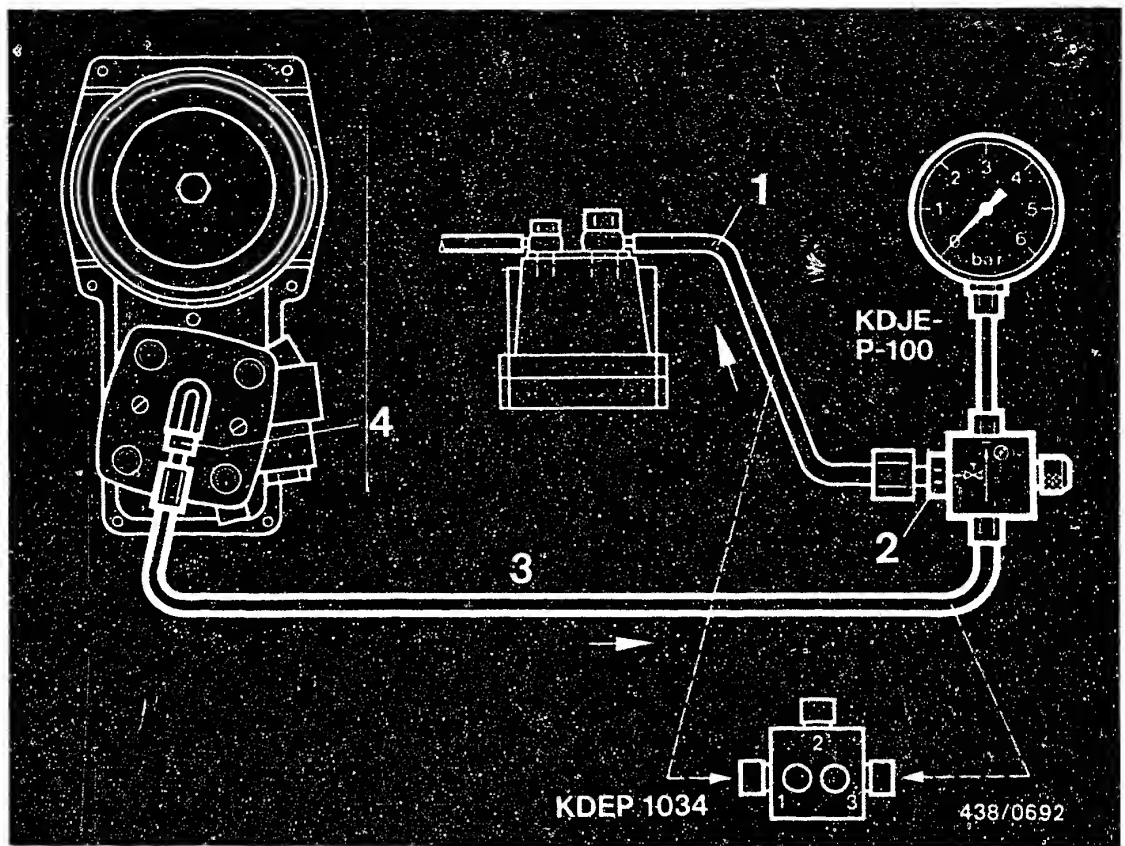
The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered (Fig. a). Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional-control valve are identified by symbols:

A = Inlet (from the fuel distributor)

B = Outlet (to the warm-up regulator)

#### Caution:

When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.

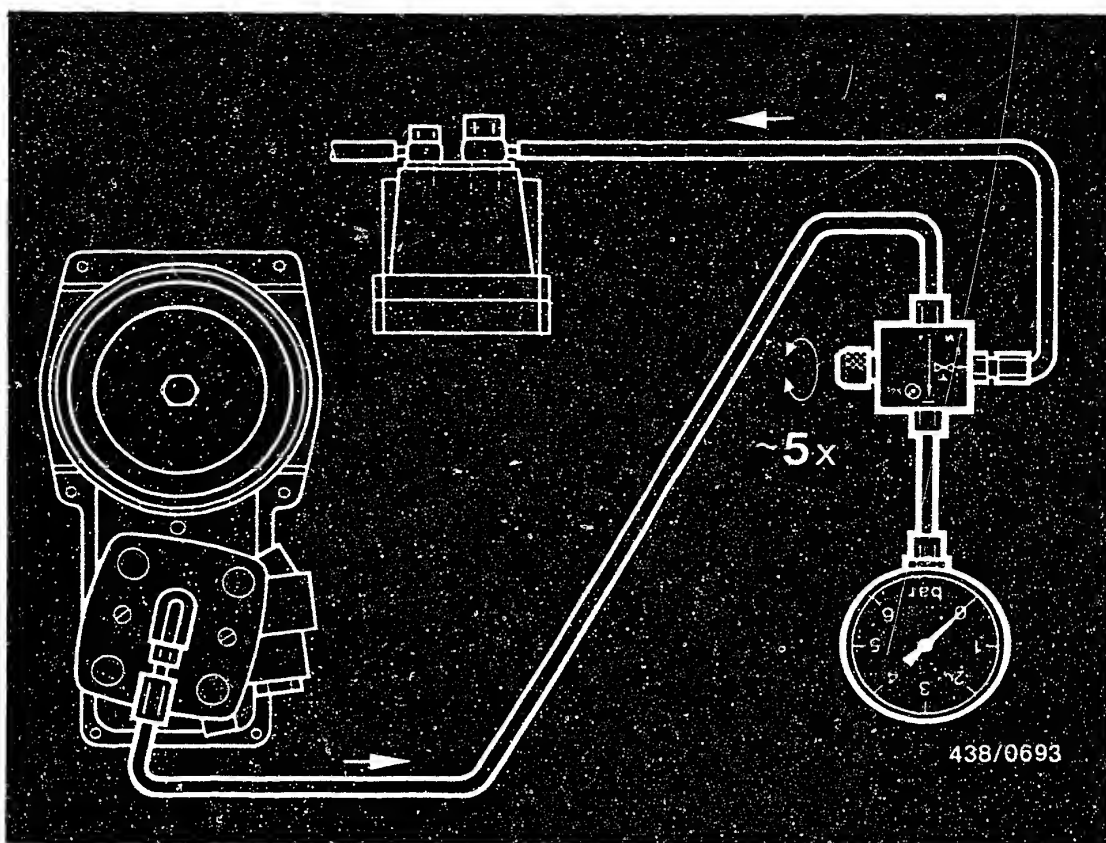


The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.

Unscrew the control-pressure line (1) from the fuel distributor and connect to outlet fitting B or 1 (2) of the directional-control valve.

Connect the hose line (3) of the pressure tester to the control-pressure connection port (4) of the fuel distributor. Suspend the pressure gauge from the hood (possibly using a wire hook).





#### 14.5 Bleeding the pressure tester

Disconnect the electric plug from the warm-up regulator and the auxiliary-air device.

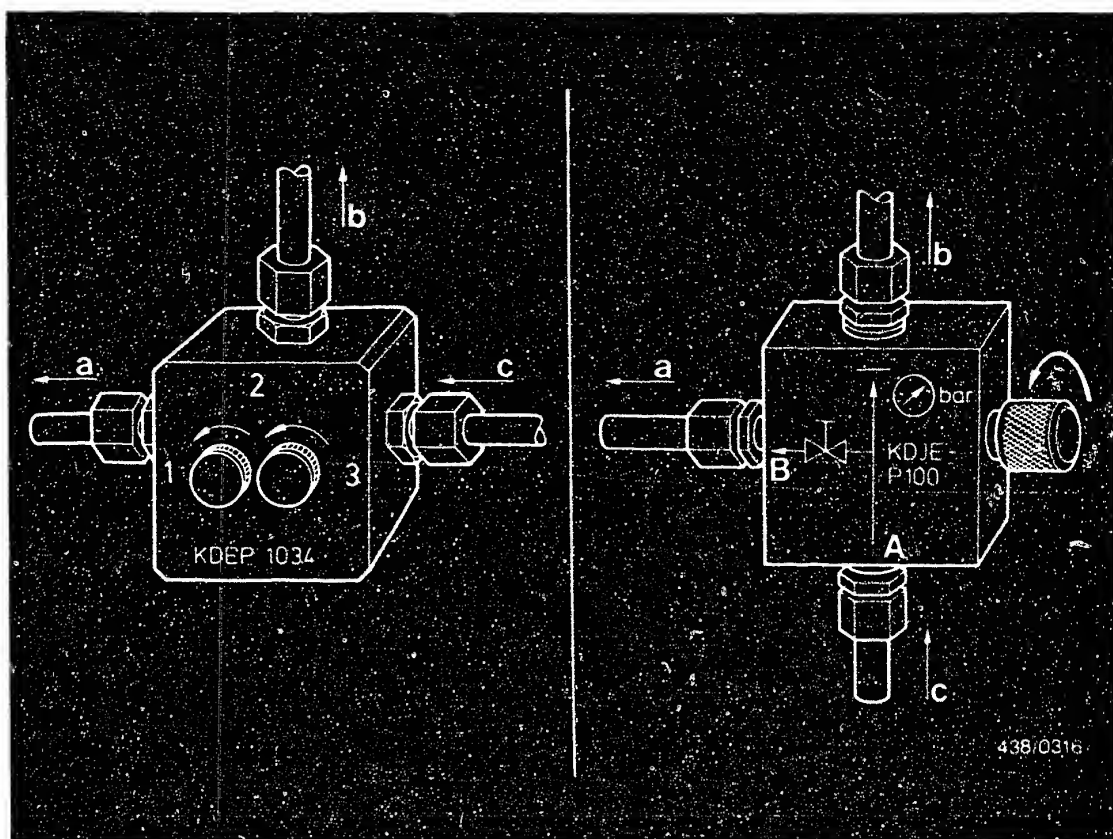
Let the pressure gauge hang down (hose fully extended).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw of the directional-control valve (valve screw 1 in the case of KDEP 1034) in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).

Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



- a = To warm-up regulator
- b = To pressure gauge
- c = From fuel distributor

#### 14.6 Testing the "cold" control pressure:

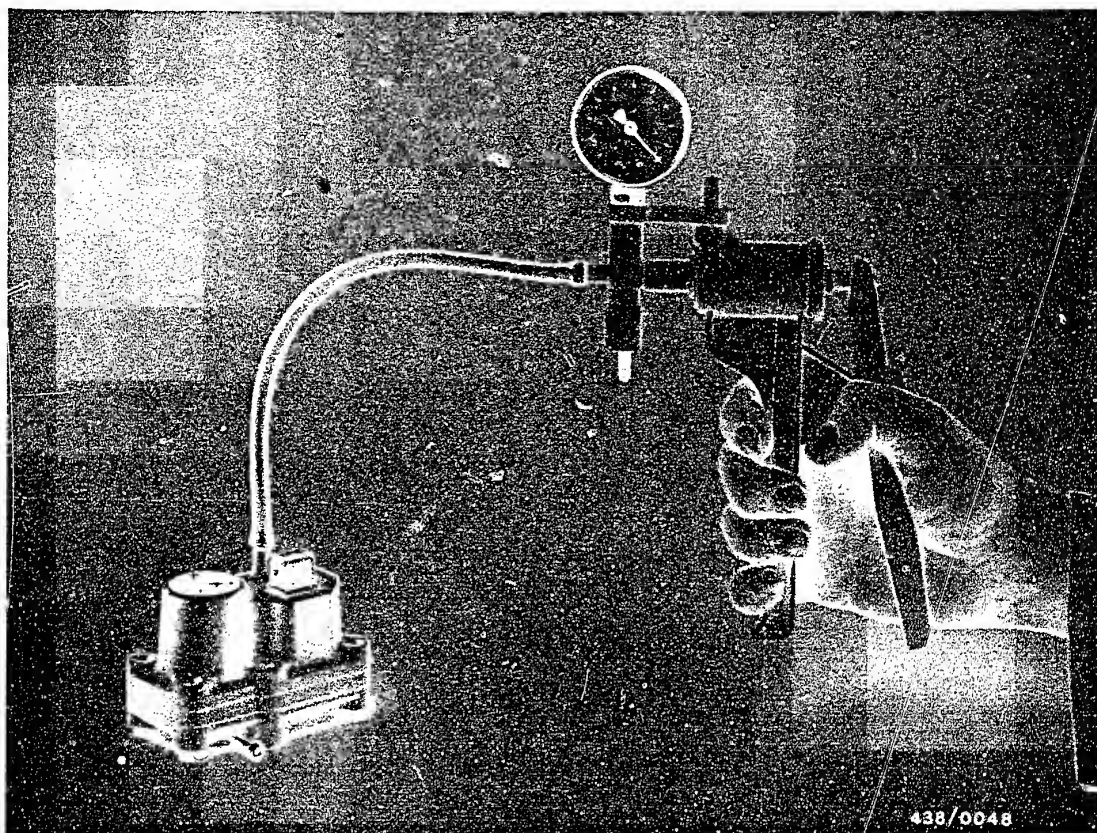
Warm-up regulator: 0 438 140 005

The test is performed with the engine switched off. The engine must be cold. For this purpose, the engine should have been switched off for several hours, preferably overnight.

Pull off the plug from the warm-up regulator.

Open the valve screw of the directional-control valve (both screws in the case of KDEP 1034).

Switch on the electric fuel pump by bridging the electrical safety circuit.



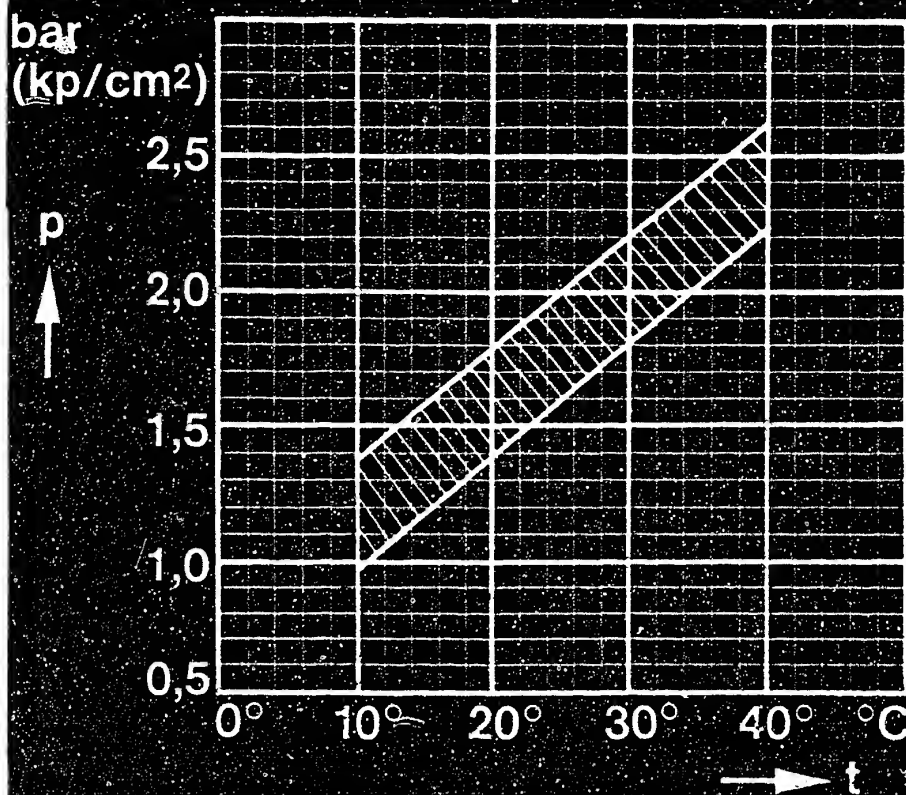
Part No. of warm-up regulator: 0 438 140 005

The control pressure is checked with simulated intake-manifold pressure, i.e. vacuum is applied to the warm-up regulator.

To do this, connect the vacuum pump to the intake-manifold-pressure connection port of the warm-up regulator on the top of the housing. The picture shows testing with the recommended Mityvac hand vacuum pump.

Setting value for testing: 510...550 mbar  
(385...415 mmHg)

The "cold" control pressure is indicated on the pressure gauge of the pressure tester.



438/5003

$p$  = Control pressure (bar and/or kgf/cm<sup>2</sup> gauge pressure)  
 $t$  = Ambient temperature (°C)

Warm-up regulator part number: 0 438 140 005  
 (Version for full-load enrichment)

Calculate the nominal control pressure in accordance with the ambient temperature in the graph.

Example: Ambient temperature = 20°C  
 Nominal control pressure = 1.4...1.8 bar gauge pressure



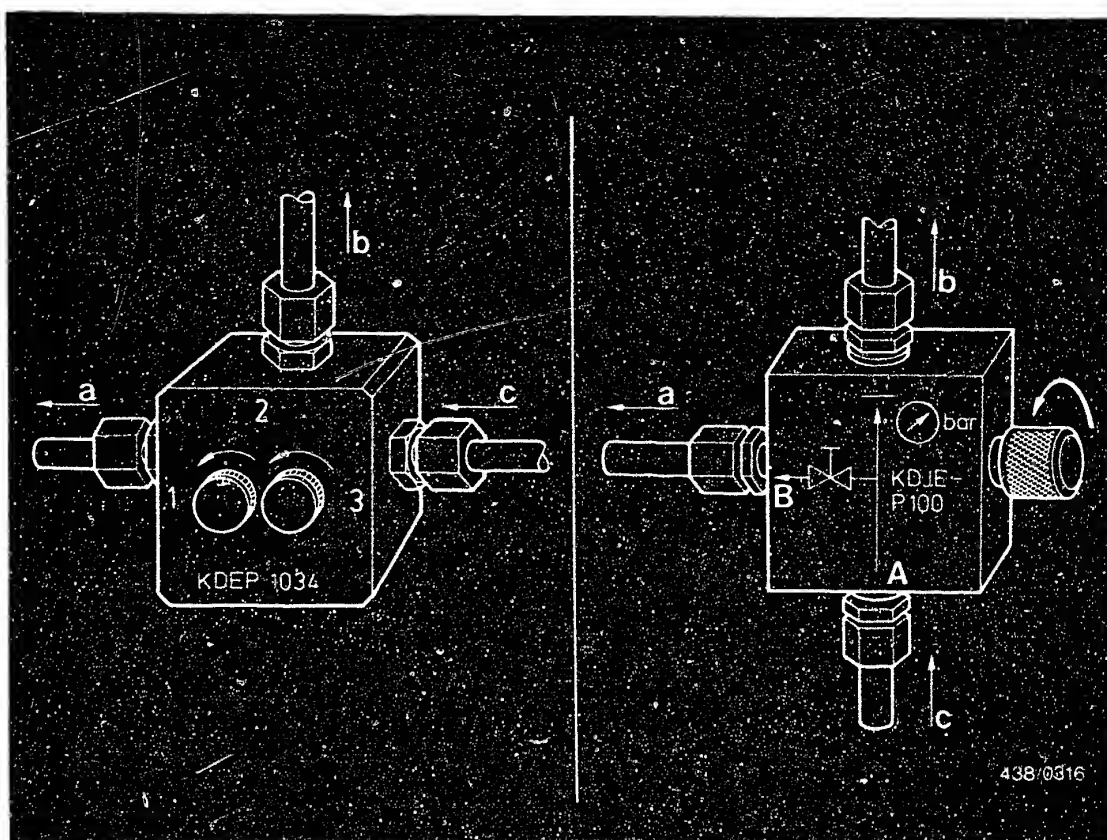
If the measured "cold" control pressure differs from the nominal value, this may be due to one of the following faults:

- Fuel delivery for the control-pressure circuit too low or too high. Test fuel delivery.  
Test value: 160...240 cm<sup>3</sup>/min.
- Fuel return from warm-up regulator blocked or constricted (if control pressure too high).  
Eliminate restriction.
- Warm-up regulator defective. Replace warm-up regulator.

When the warm-up regulator has been replaced or a fault remedied, carry out the idle adjustment with the engine at normal operating temperature.

Idle adjustment is described on Coordinates G14.





- a = To warm-up regulator
- b = To pressure gauge
- c = From fuel distributor

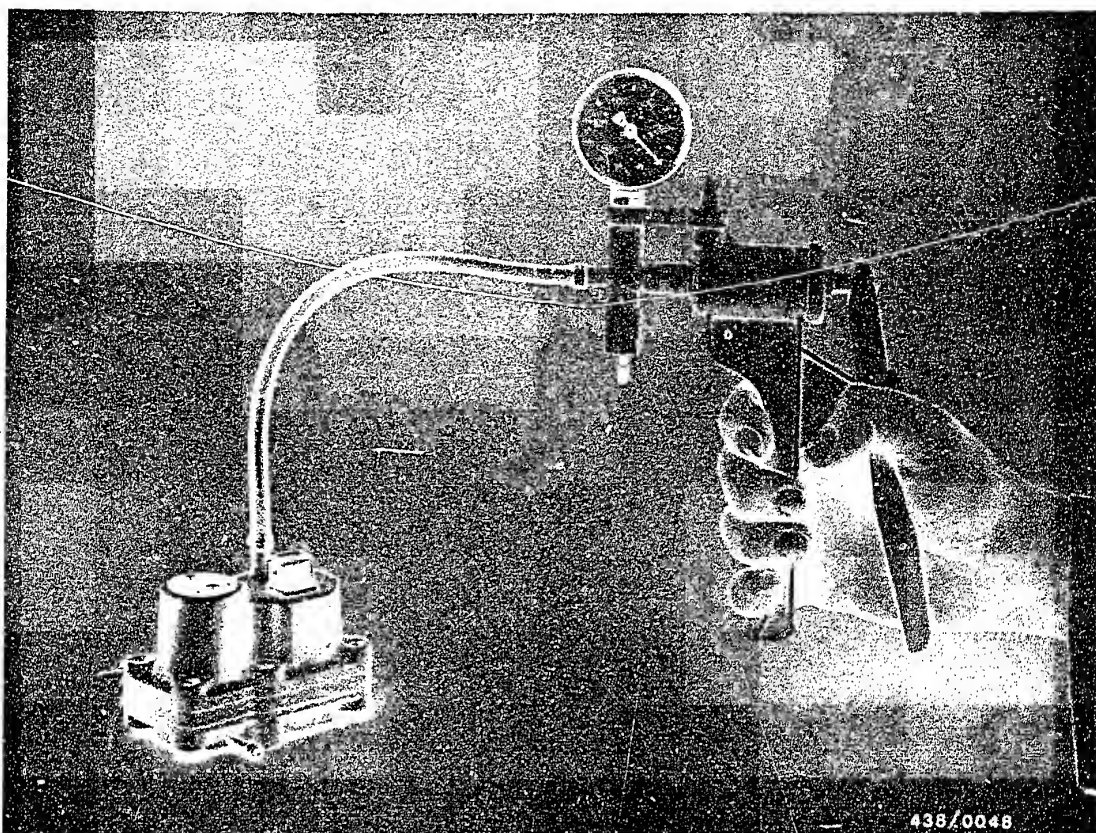
#### 14.7 Checking the "warm" control pressure

Warm-up regulator Part No.: 0 438 140 005

The test is performed with the engine switched off, once without intake-manifold pressure being applied, once with simulated intake-manifold pressure (vacuum) applied.

Open the valve screw of the directional-control valve (or both valves in the case of KDEP 1034).





- Warm-up regulator Part No. 0 438 140 005

For testing with simulated intake-manifold pressure, connect the vacuum pump to the intake-manifold-pressure connection port of the warm-up regulator (on top of the housing, next to the plug housing).

The picture shows the recommended Mityvac hand pump.

Setting value for the test: 510...550 mbar  
(385...415 mmHg)



## Test procedure:

The temperature of the engine is not important.

Open the valve screw of the directional-control valve (both in the case of KDEP 1034).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Plug the plug onto the warm-up regulator.

The control pressure increases (warm-up regulator in the process of shutting off) until the "warm" control pressure is reached.

Test first of all without the application of intake-manifold pressure, then test with simulated intake-manifold pressure (vacuum) in accordance with the values given below:

Test step	Test specifications*
<u>"Warm" control pressure</u>	
Part No. of warm-up regulator:	
0 438 140 005	
● Test with	
atmospheric pressure (without vacuum)	2.7...3.1 bar (2.8...3.2 kgf/cm <sup>2</sup> )
● For testing, connect vacuum pump to intake-manifold-pressure connection of warm-up regulator.	
Setting value:	
510...550 mbar (385...415 mmHg)	<u>3.4...3.8 bar</u> (3.5...3.9 kgf/cm <sup>2</sup> )

\*Pressures in the test-specification table are given in bar (gauge pressure) and/or in kgf/cm<sup>2</sup> (gauge pressure).



If the measured "warm" control pressure differs from the test specification, this may be due to one of the following faults:

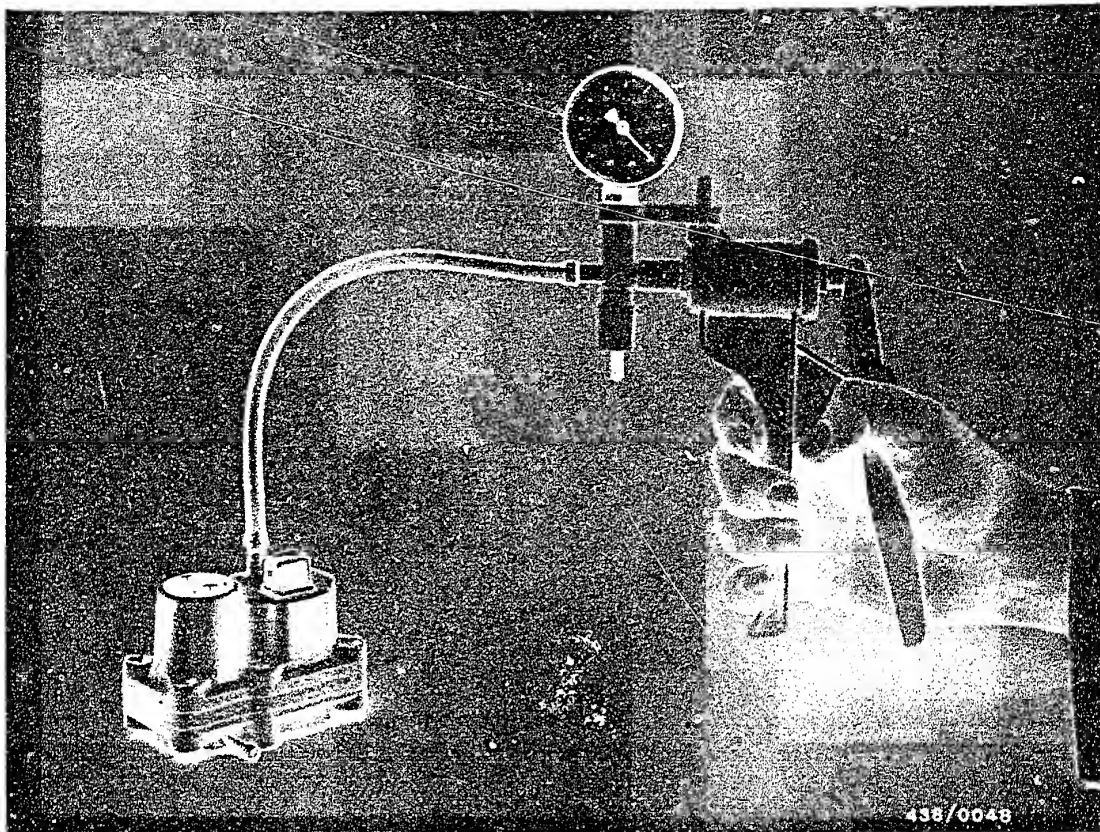
If control pressure too high:

- Fuel delivery for the control-pressure circuit too high.  
Test fuel delivery.  
Test specification: 160...240 cm<sup>3</sup>/min.
- Fuel return from the warm-up regulator blocked or constricted. Eliminate constriction.
- Warm-up regulator has hydraulic defect.  
Replace warm-up regulator.

If control pressure too low:

- Power supply open-circuit.  
Eliminate open circuit. Ensure that the plug is contacting properly.
- Battery voltage too low, voltage drop.  
Eliminate voltage drop. Minimum voltage at connector: 11.5 V.  
If necessary, repeat test with engine running in order to obtain the normal generator voltage of approx. 14 V when the vehicle is in operation.
- Fuel delivery for the control-pressure circuit too low.  
Test fuel delivery.  
Test specification: 160...240 cm<sup>3</sup>/min.
- Warm-up regulator defective. Heating coil open-circuit. Hydraulic defect. Replace warm-up regulator.





- Testing the full-load diaphragm for leaks  
on warm-up regulator 0 438 140 005

Switch off the electric fuel pump.  
Connect the "Mityvac" hand vacuum pump to the intake-  
manifold-pressure connection port of the warm-up  
regulator and build up a vacuum.

Setting value: 510...550 mbar (385...415 mmHg).

Max. pressure drop within 15 s 100 mbar (75 mmHg).  
If the pressure drop is too great, replace the warm-up  
regulator.

Note:

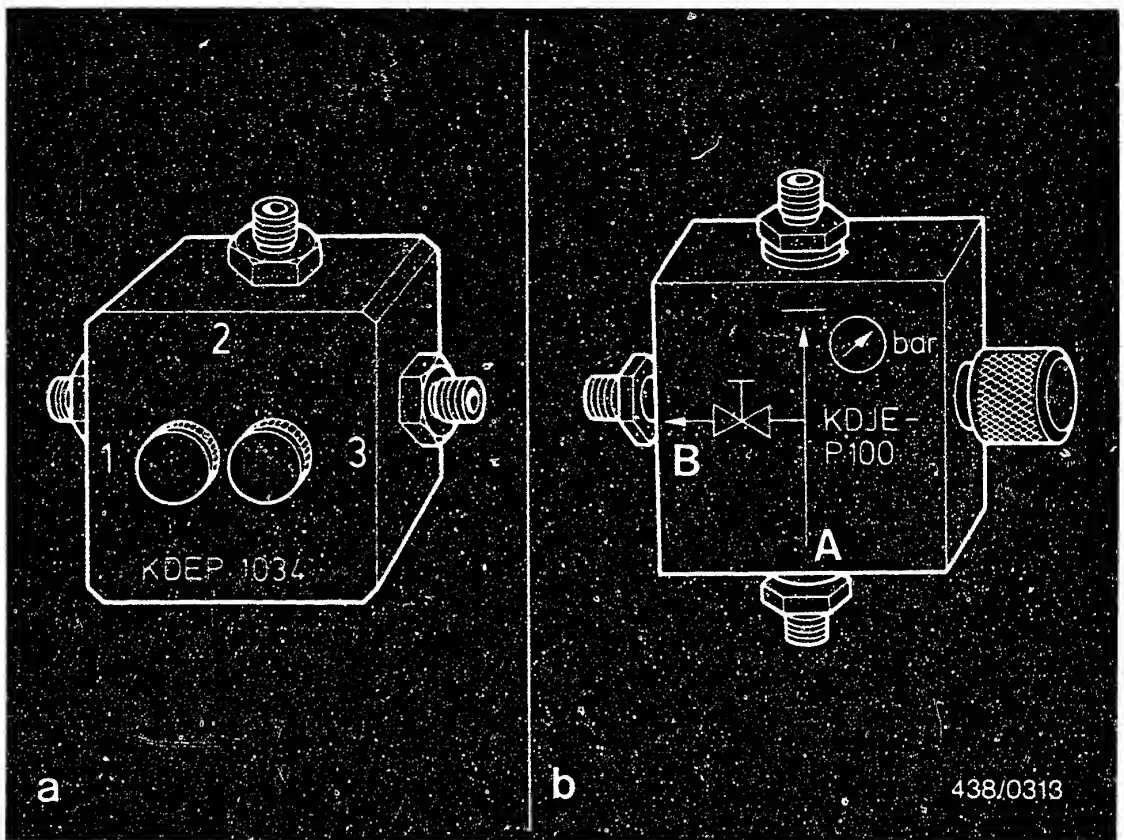
Incorrect control-pressure functions during vehicle operation may also be due to a malfunction in the intake-manifold-pressure control system for the warm-up regulator.

Therefore, check the condition and correct installation of the connecting hose from the intake manifold to the warm-up regulator. Check the system with the engine running and at normal operating temperature. This test is best combined with the final idle adjustment.

When the warm-up regulator has been replaced or a fault remedied, carry out the idle adjustment with the engine at normal operating temperature.

Idle adjustment is described on Coordinate G 14.



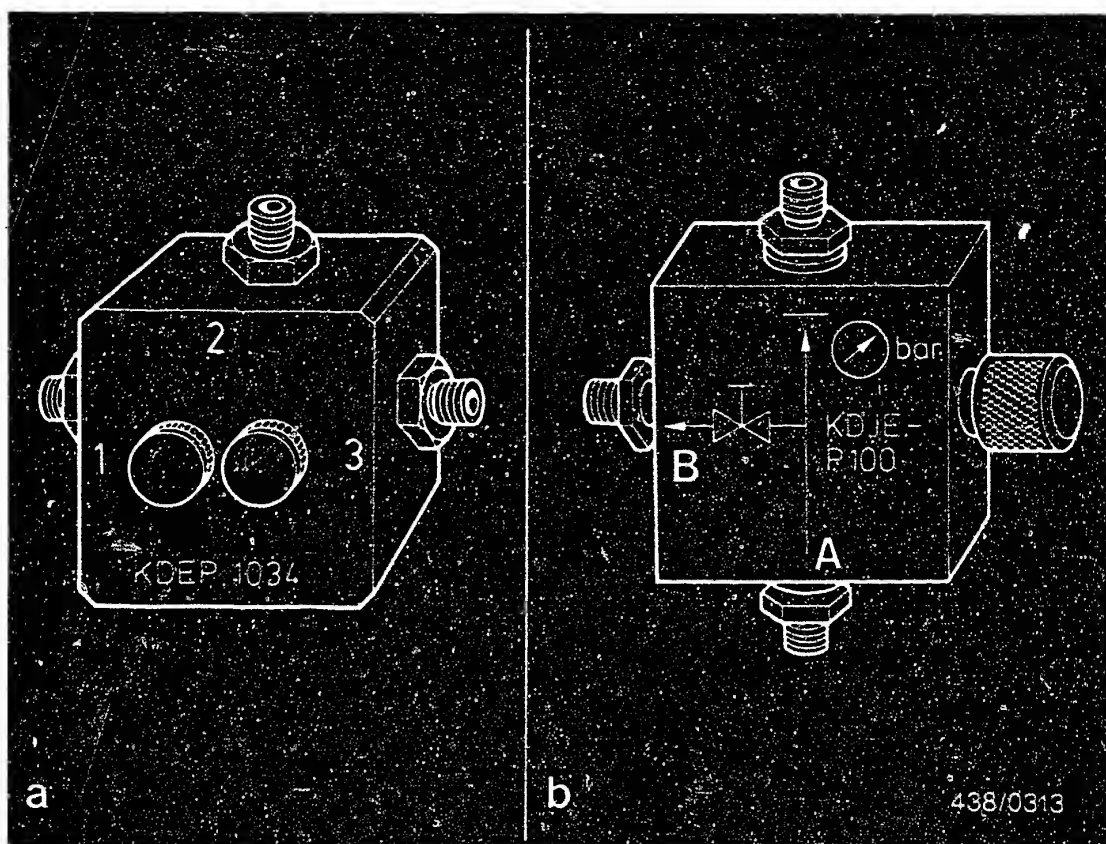


## 15. Testing and adjusting the primary (system) pressure:

### 15.1 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered (Fig. a).



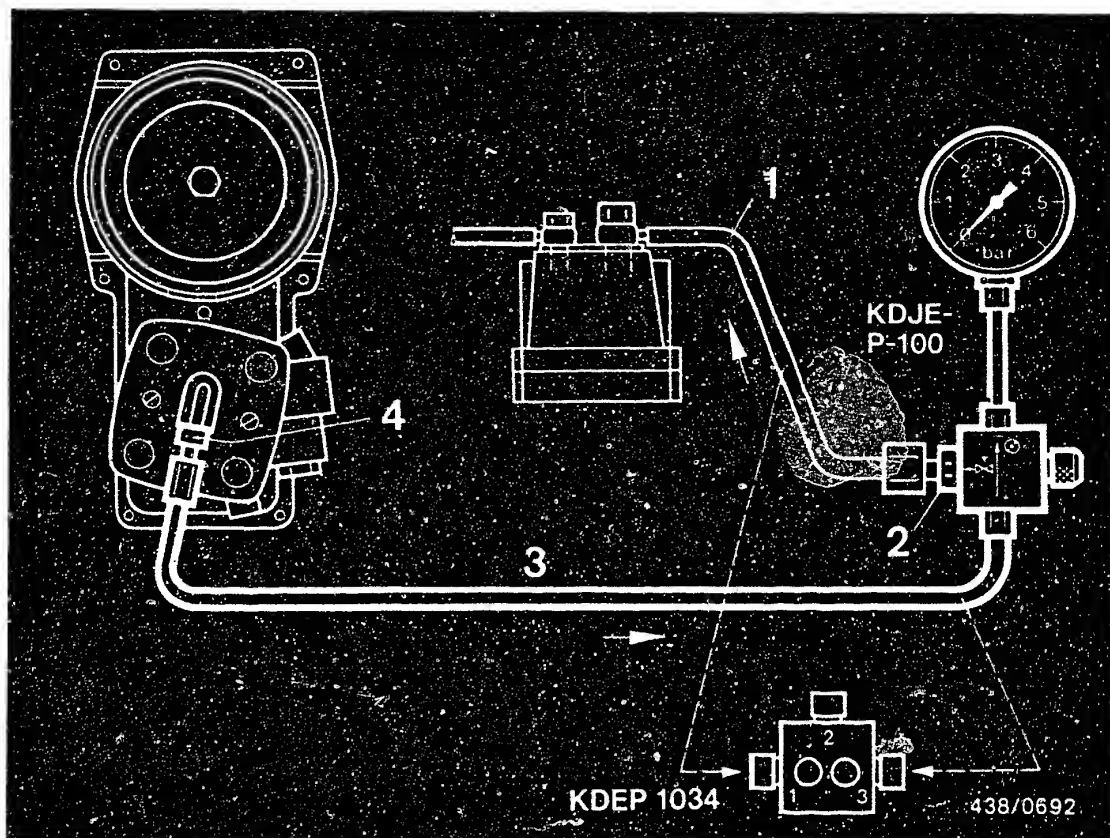


Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional-control valve are identified by symbols:

- A = Inlet (from the fuel distributor)
- B = Outlet (to the warm-up regulator)

**Caution:**

When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



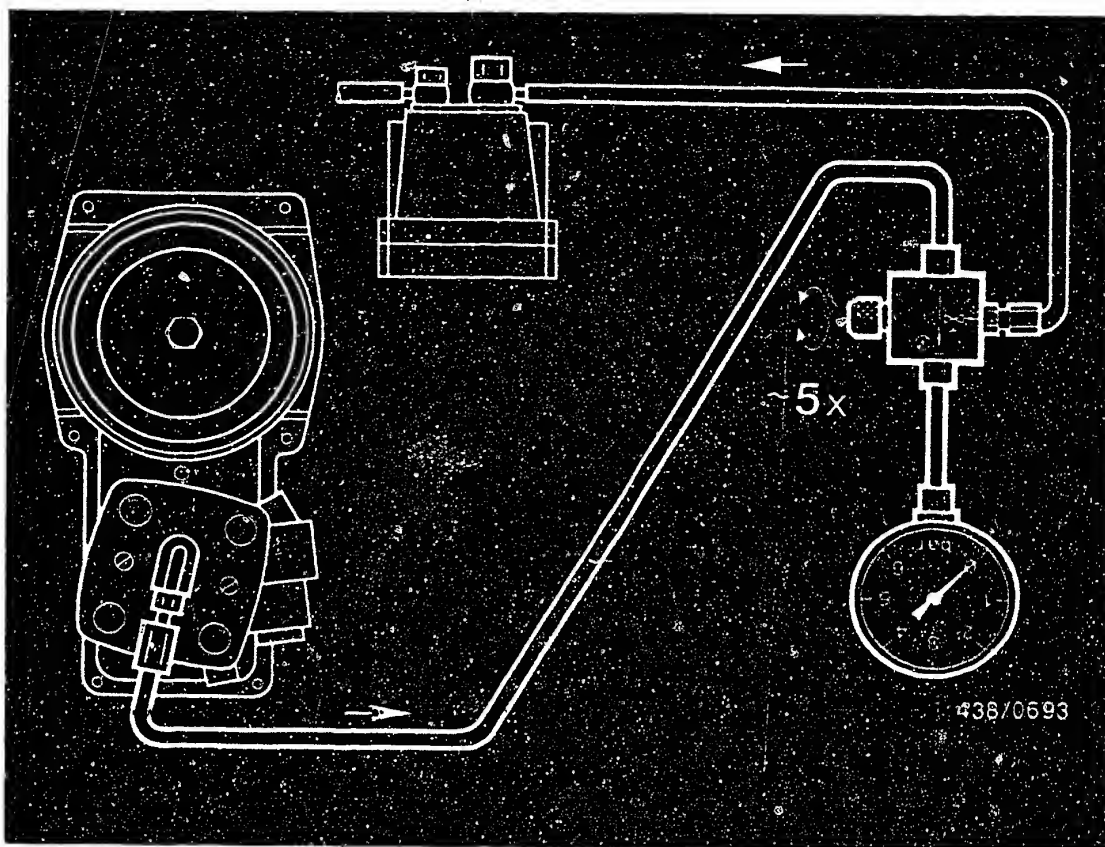
The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.

Unscrew the control-pressure line (1) on the fuel distributor and connect to outlet fitting B or 1 (2) of the directional-control valve.

Connect the hose line (3) of the pressure tester to the control-pressure connection port (4) on the fuel distributor.

Suspend the pressure gauge from the engine-compartment lid (possibly using a wire hook).





## 15.2 Bleeding the pressure tester

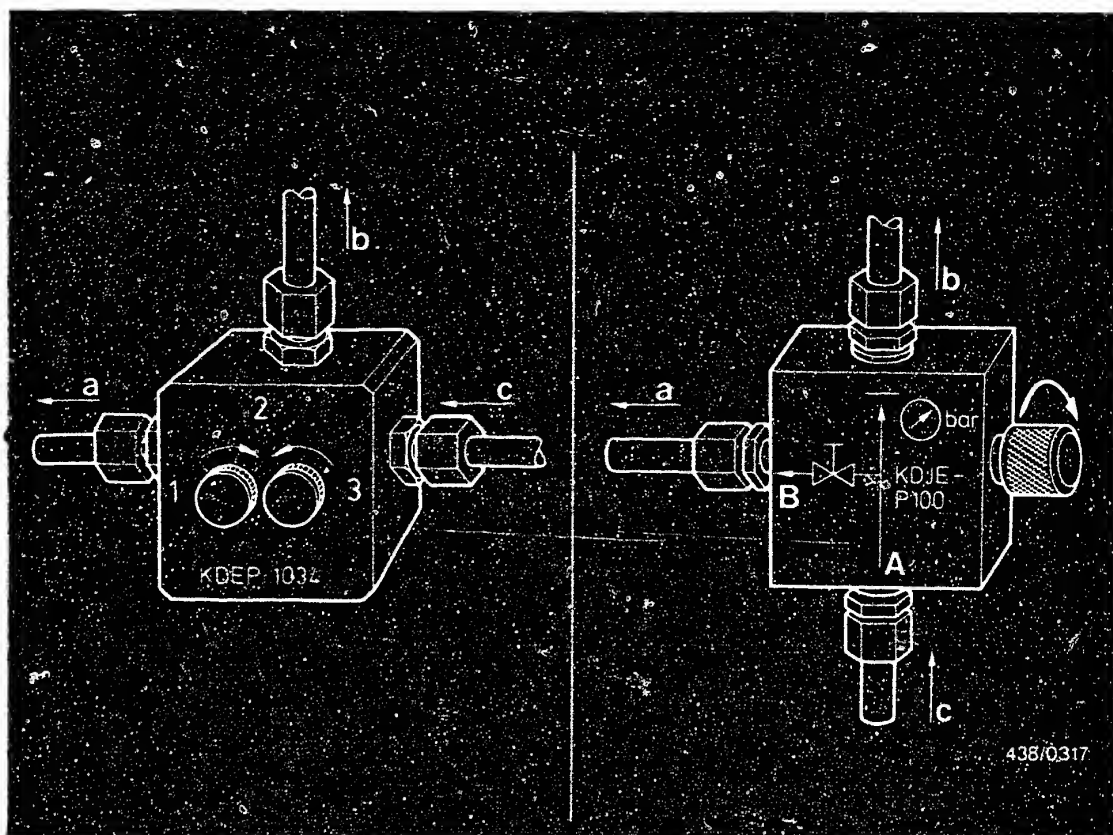
Disconnect the electric plug from the warm-up regulator and the auxiliary-air device.

Let the pressure gauge hang down (hose fully extended).

Switch on the electrical fuel pump by bridging the electrical safety circuit:

Open and close the valve screw of the directional-control valve (valve screw 1 in the case of KDEP 1034) in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood). Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



- a = To warm-up regulator
- b = To pressure gauge
- c = From fuel distributor

### 15.3 Testing the primary pressure:

The test is performed with the engine switched off.  
The temperature of the engine is not important.

Close the valve screw of directional-control valve KDJE-P 100. In the case of KDEP 1034, close valve screw 1, open valve screw 3.

Switch on the electric fuel pump by bridging the electrical safety circuit.

The pressure gauge now indicates the primary pressure.

Fuel distributor Part No.	Test specifications - primary pressure (gauge pressure)
0 438 100 005 0 438 100 023	<u>4,5...5,2 bar</u> (4,6...5,3 kgf/cm <sup>2</sup> )

Possible causes for too low a primary pressure:

- Fuel supply faulty  
(Delivery of electric fuel pump too low).
- Primary pressure set incorrectly.

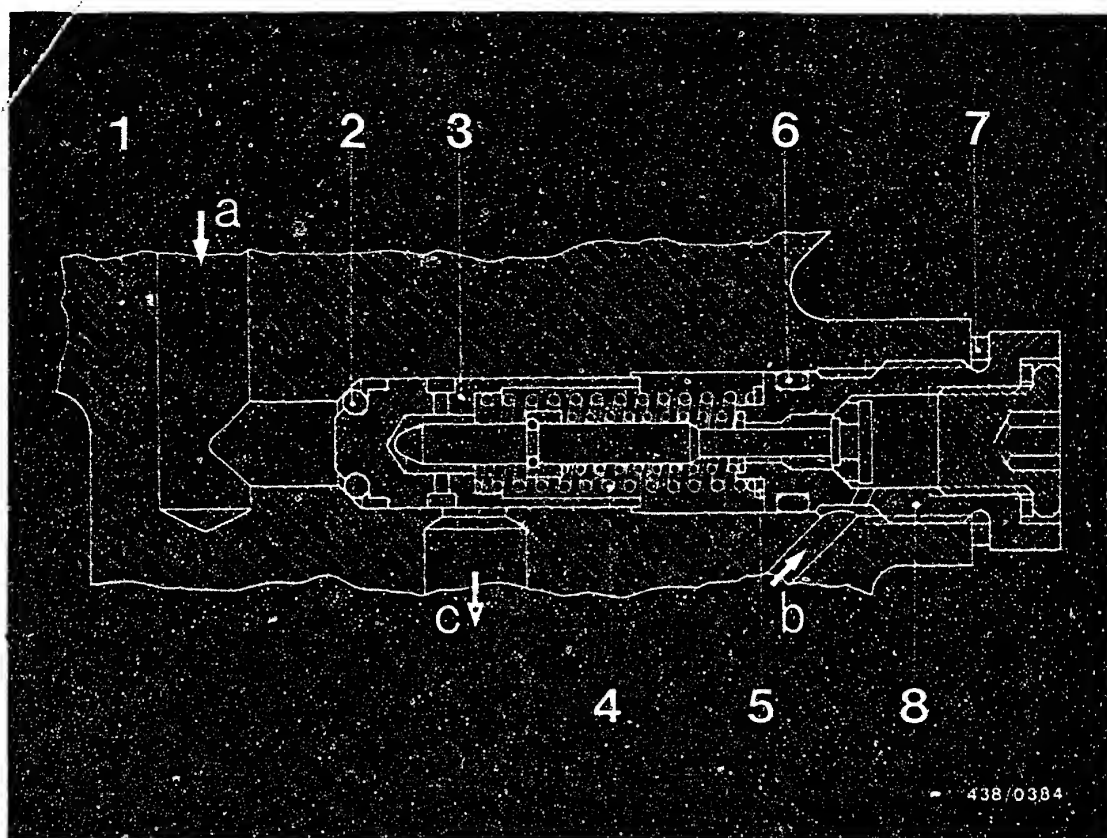
A precondition for readjustment of the primary pressure is always that the fuel supply is in order.  
Measure the fuel delivery. (Test specification: 750 cm<sup>3</sup>/30 s.

Possible causes for too high a primary pressure:

- A restriction in the return line leading to the fuel tank.
- Primary-pressure regulator set incorrectly.

For this reason, before readjusting too high a primary pressure, always first check the condition of the return line leading to the fuel tank.





- |                              |                    |
|------------------------------|--------------------|
| a = Primary pressure         | 4 = Control spring |
| b = From warm-up regulator   | 5 = Shim(s)        |
| c = Fuel return              | 6 = O-ring         |
| 1 = Fuel-distributor housing | 7 = Flat seal ring |
| 2 = O-ring.                  | 8 = Screw plug     |
| 3 = Control piston           |                    |

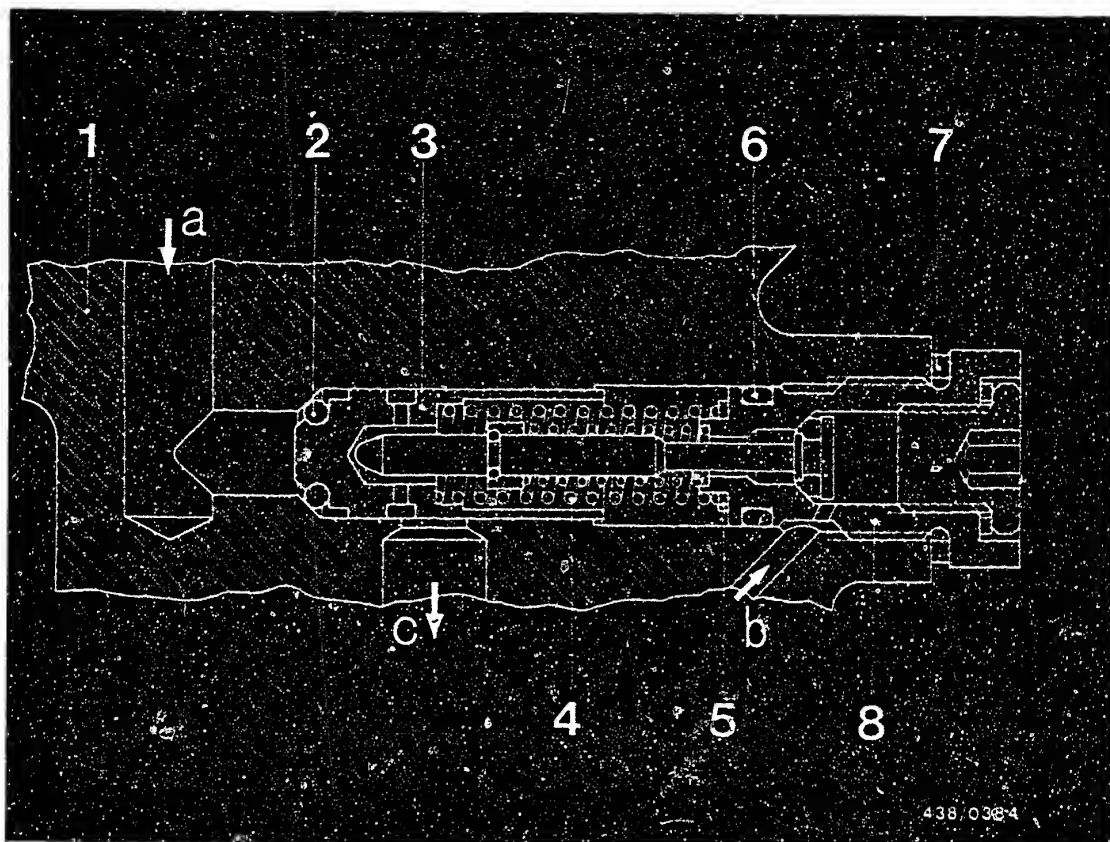
#### 15.4 Adjusting the primary pressure:

Fuel distributor Part No.	Adjustment values - primary pressure (gauge pressure)
0 438 100 005	4.7...4.9 bar (4.8...5.0 kgf/cm <sup>2</sup> )
0 438 100 023	

**E7**

Testing/adjusting the primary pressure  
BMW 320i/520i 4-cylinder engine





The primary pressure is readjusted by replacing the shims (Item 5).

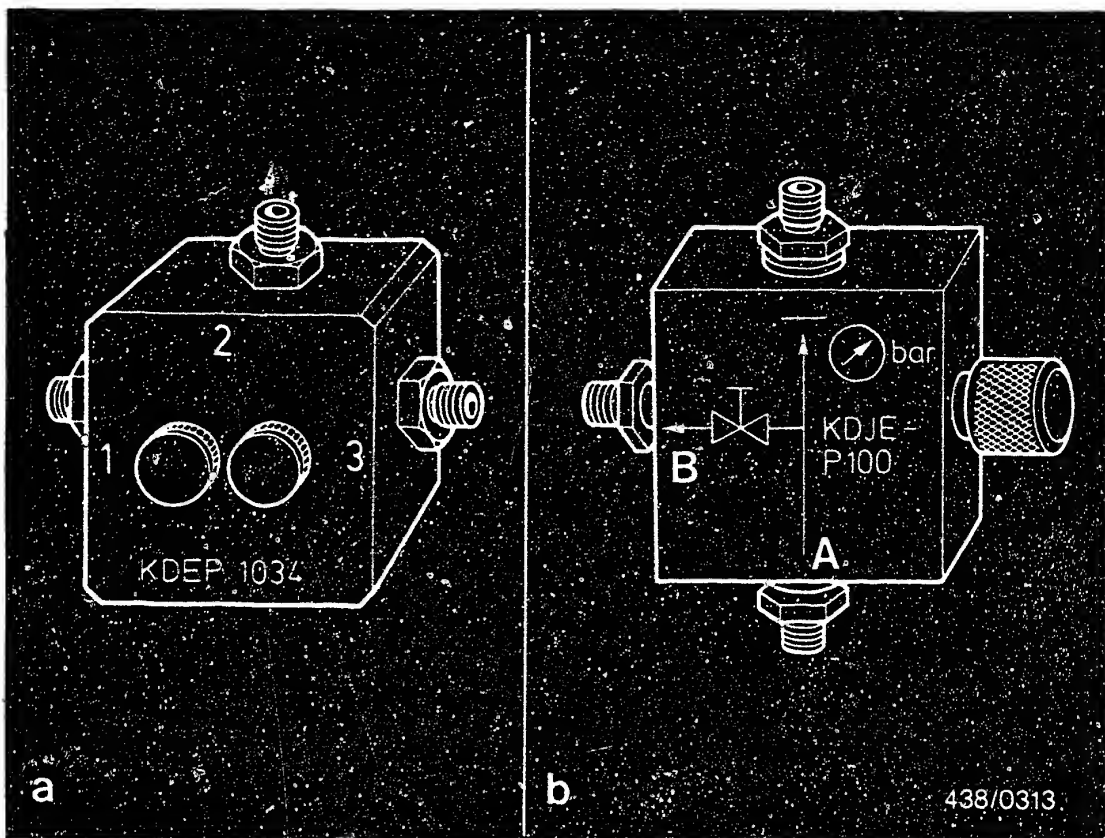
Note:

0.1 mm more of shim thickness means about 0.15 bar pressure increase and vice versa.

To do this, screw out the large screw plug (Item 8) together with the push valve. After carrying out the adjustment, always fit the screw plug with a new flat seal ring (Item 7) and O-ring (Item 6).

The control piston (Item 3) of the primary-pressure regulator must not be lost. It was matched specially to the fuel distributor housing in the manufacturing plant and therefore is the only part of the primary-pressure regulator which must not be replaced.



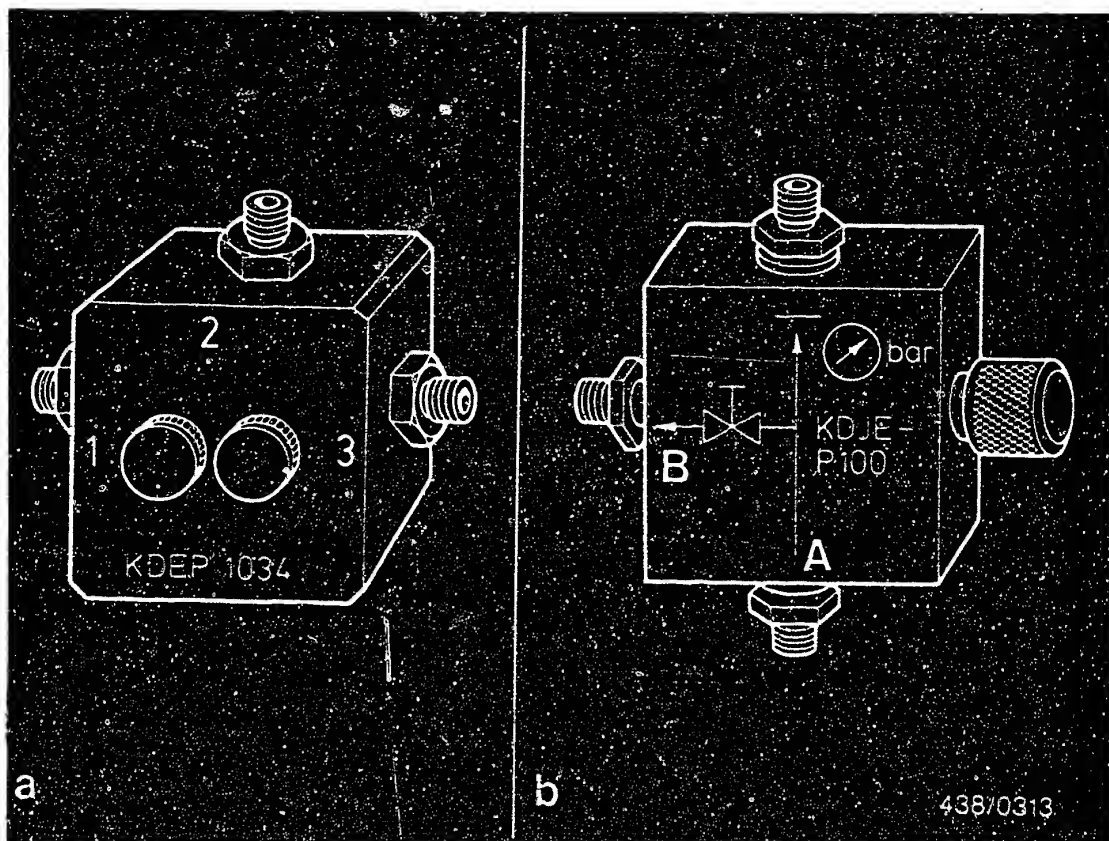


## 16. Testing the entire fuel system for leaks.

### 16.1 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered (Fig. a).





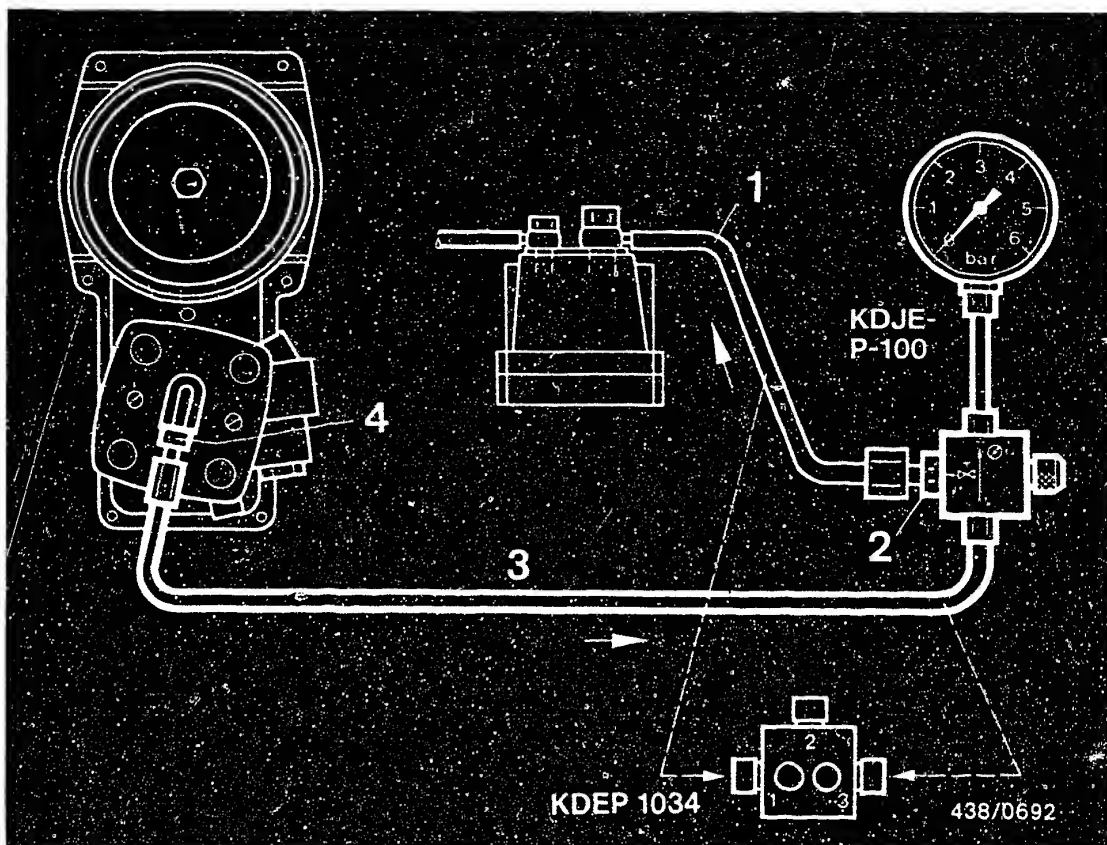
Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional-control valve are identified by symbols:

- A = Inlet (from the fuel distributor)
- B = Outlet (to the warm-up regulator)

Caution:

When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.





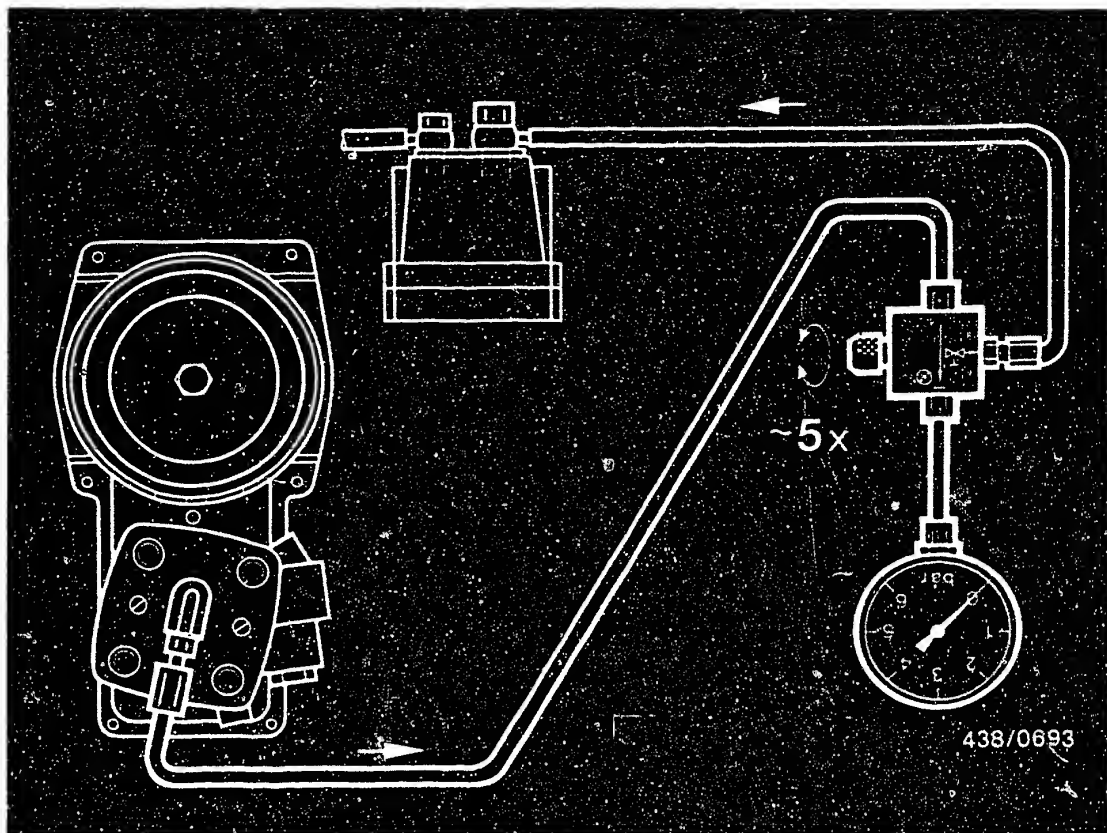
The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.

Unscrew the control-pressure line (1) from the fuel distributor and connect to outlet fitting B or 1 (2) of the directional-control valve.

Connect the hose line (3) of the pressure tester to the control-pressure connection port (4) of the fuel distributor.

Suspend the pressure gauge from the hood (possibly using a wire hook).





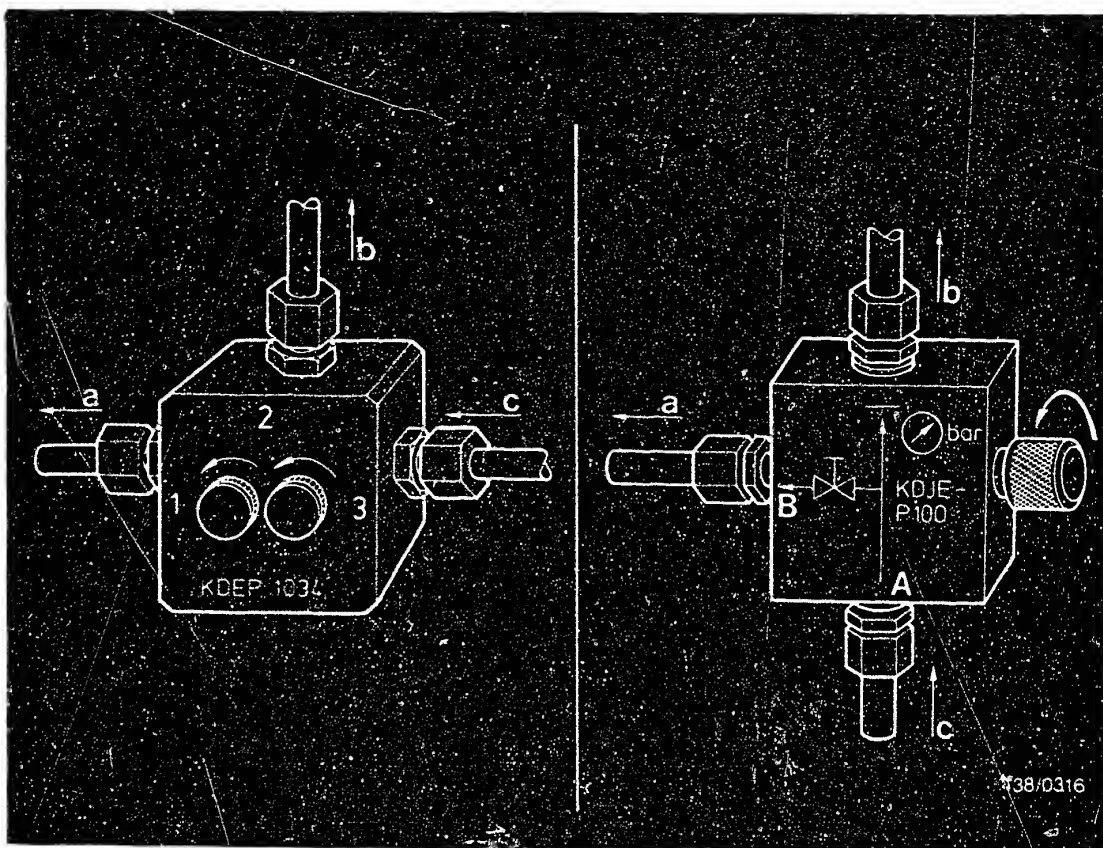
## 16.2 Bleeding the pressure tester:

Disconnect the electric plug from the warm-up regulator and the auxiliary-air valve.

Let the pressure gauge hang down (hose fully extended). Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw of the directional-control valve (valve screw 1 in the case of KDEP 1034) in a 10-second rhythm about 5 times. Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).

Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



- a = To warm-up regulator
- b = To pressure gauge
- c = From fuel distributor

### 16.3 Leak test

The test is performed with the engine switched off. Make the test with a warm engine but not immediately after the engine has been operated at a high temperature.

Open the valve screw of the directional-control valve (both valves in the case of KDEP 1034).



Switch on the electric fuel pump by bridging the electrical safety circuit until the warm-up regulator has ceased to operate ("warm" control pressure).

Switch the electric fuel pump off again and observe the drop in pressure on the pressure gauge.

Test specifications for leak test:

Minimum pressure (gauge pressure)

after 10 minutes: 1.9 bar (2.0 kgf/cm<sup>2</sup>)

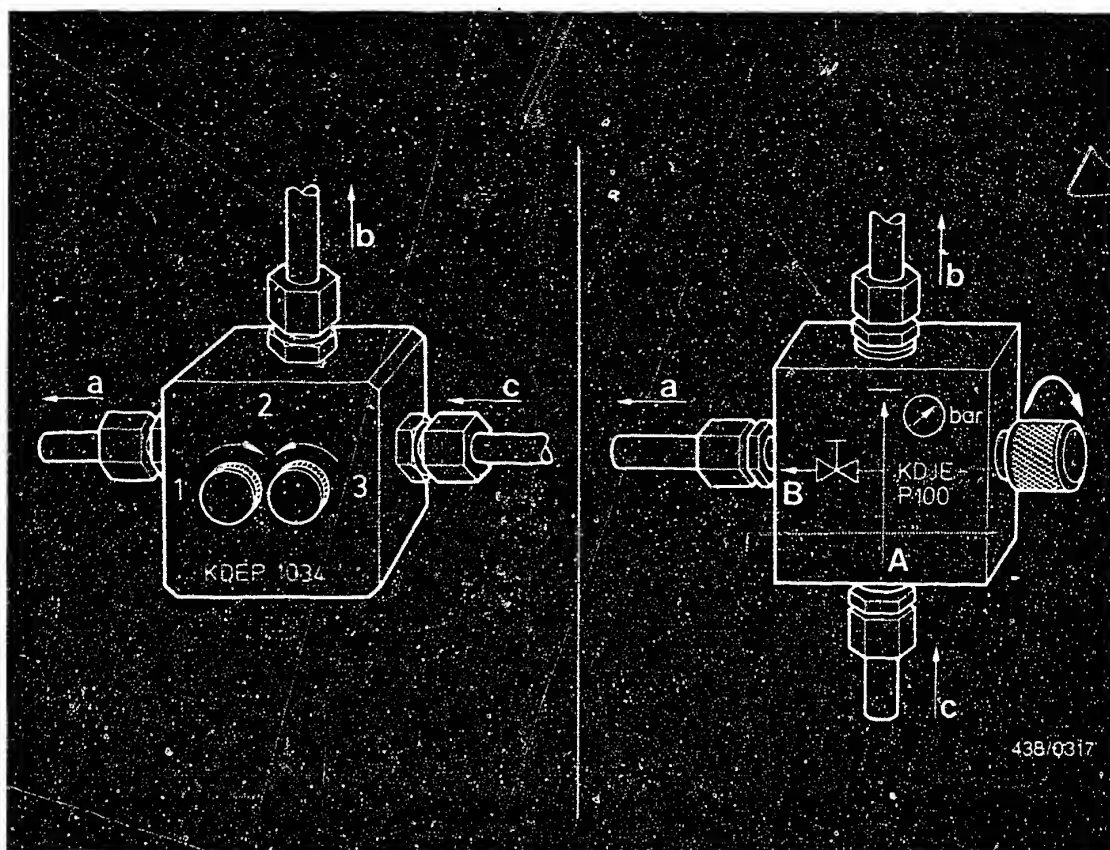
after 20 minutes: 1.7 bar (1.8 kgf/cm<sup>2</sup>)

**E14**

Leak test on fuel system

BMW 320i/520i 4-cylinder engine





a = To warm-up regulator.  
b = To pressure gauge  
c = From fuel distributor

If the pressure drops too quickly, repeat the test with the control-pressure circuit disconnected.

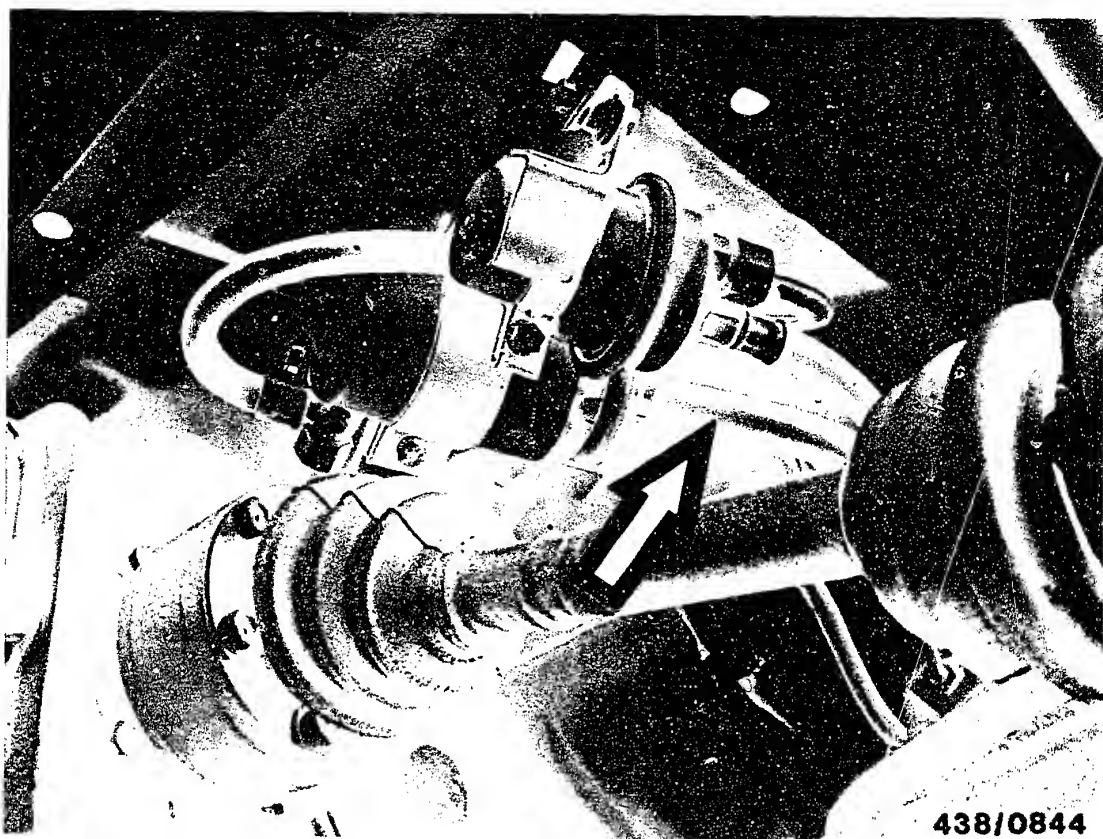
Position of the valve screws:

Close the valve screw of the directional-control valve KDJE-P 100.

In the case of KDEP 1034, close valve screw 1, open valve screw 2.

If the same result is found, the leak is in the primary-pressure circuit.

If the test results are correct during the second test, the leak is in the control-pressure circuit.



#### 16.4 Possible causes of trouble in the primary-pressure circuit:

- Non-return valve of electric fuel pump leaking.

1976 model: Electric fuel pump 0 580 254 992

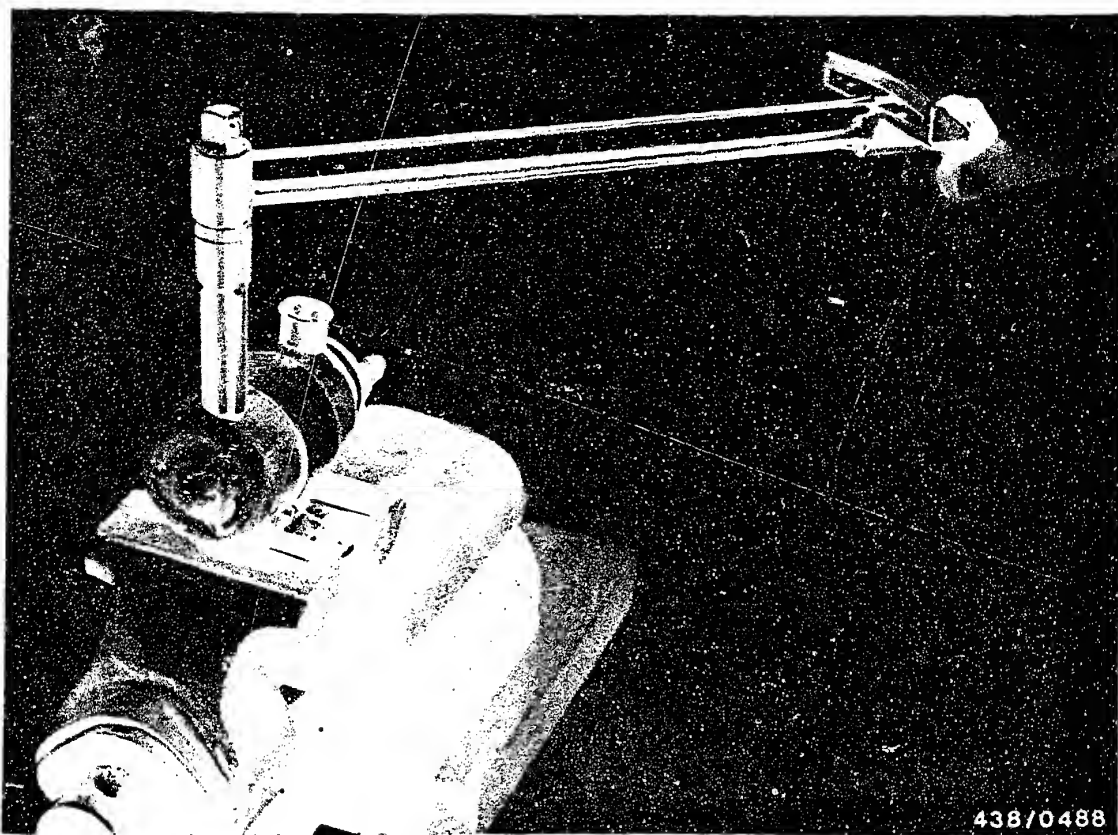
The non-return valve is integrated in the tube fitting on the pump delivery side. If leaking, replace the tube fitting.

Parts set 1 587 010 001

Remove electric fuel pump.

Pinch off intake hose (arrow)(e.g. using Matra hose clamber W 157) so that no fuel can flow from the fuel tank.





Clamp the pump in a vise by the clamping clip (never clamp by the pump housing). Remove the delivery hose from the tube fitting and screw off the fitting.

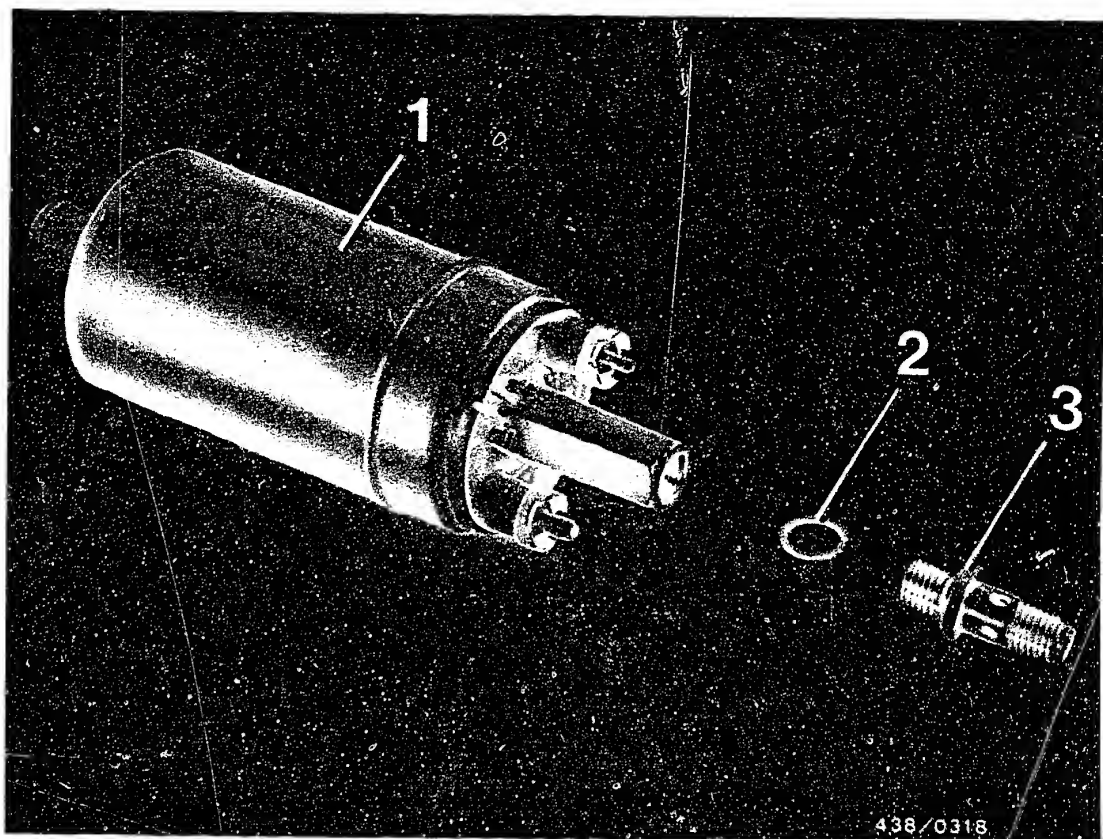
Caution: No dirt or chips must get into the inside of the pump.

Always screw in a new tube fitting with a new seal ring. Tightening torque 16...20 Nm (1.6...2.0 kgfm).

Caution: Use only the specified seal ring, since it is of special dimensions. Always observe the specified tightening torque and do not exceed, otherwise there is the danger of warping the housing and damaging the thread.







- 1 = Electric fuel pump
- 2 = Flat seal ring
- 3 = Tube fitting

- Non-return valve in the pressure connection piece of the electric fuel pump has a leak.

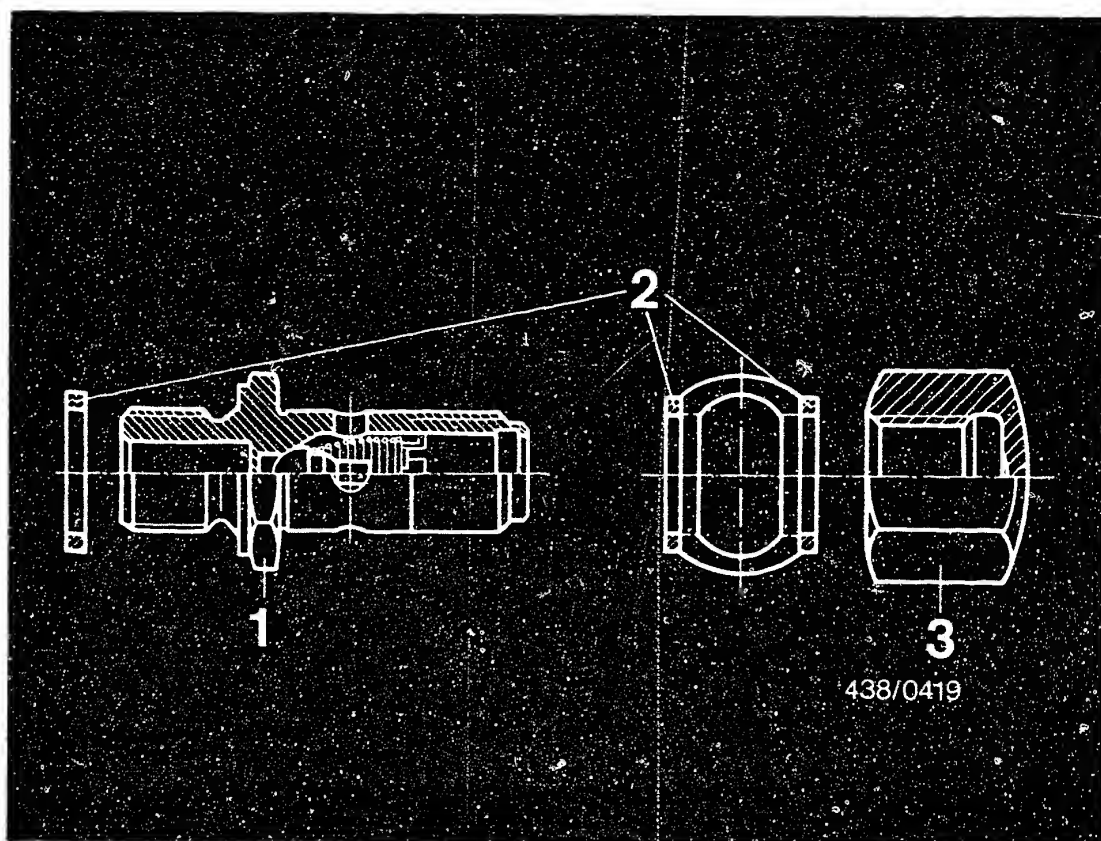
From 1977 model:

Part No. of electric fuel pump: 0 580 254 982 to FD 822  
The non-return valve is built into the tube fitting and cannot be exchanged.

In order to avoid having to change the whole electric fuel pump in the case of a leaking non-return valve, a parts set has been produced with a separate non-return valve, which can be used on the above-mentioned electric fuel pump.

Part No. of parts set: 1 587 010 003.





- 1 = Tube fitting with built-in non-return valve
- 2 = Flat seal rings
- 3 = Cap nut

Parts set: 1 587 010 003

## Installation:

Thoroughly clean the connection of the delivery line on the electric fuel pump.

Pinch off the intake hose (fuel tank - electric fuel pump) (e.g. using hose clamber W 157 from Matra Co.). Screw off the delivery line, collecting any escaping fuel.

The defective original non-return valve remains in the electric fuel pump.

Screw a tube fitting of the parts set (short end) with thick flat seal ring into the pressure connection piece and tighten to a torque of 17...25 Nm.

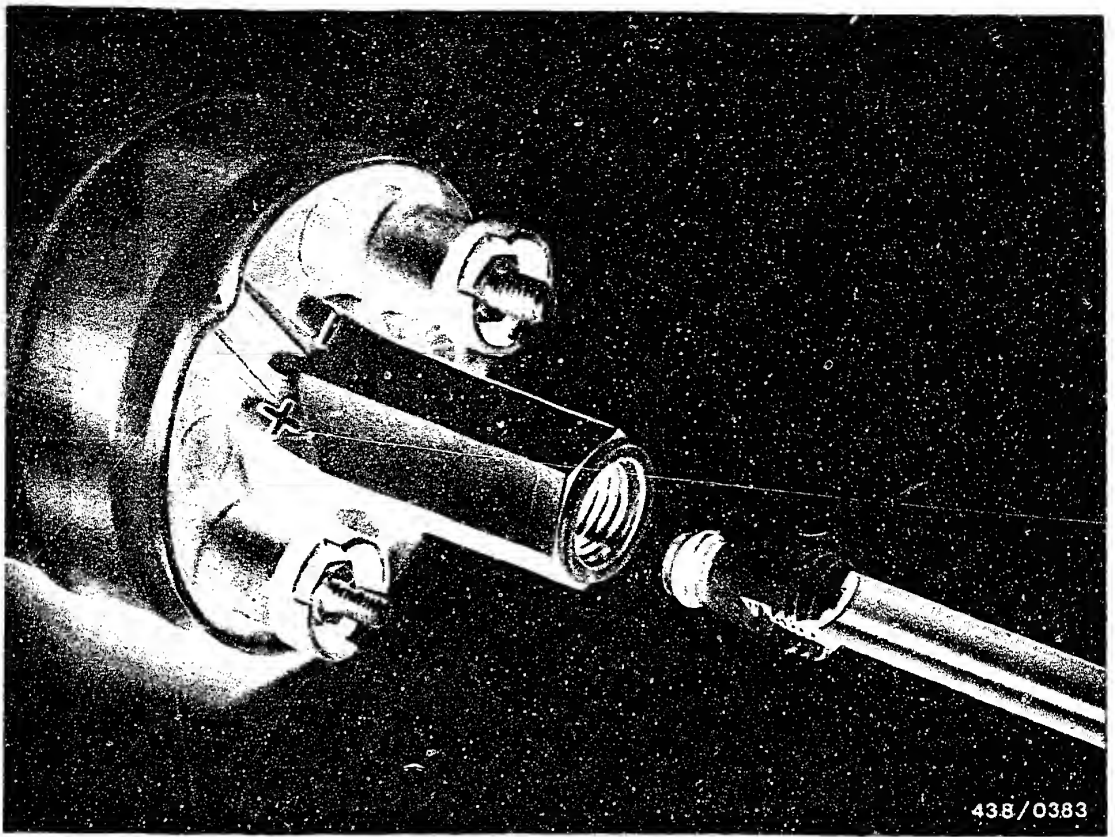
At the same time apply a wrench to the hexagonal section of the pressure connection piece.

Fit a thin flat seal ring, fuel-line inlet union and another flat seal ring onto the long end of the tube fitting and tighten with the hexagon cap nut.

Remove hose clamber from intake hose.

Check connections for leaks with the electric fuel pump in operation.



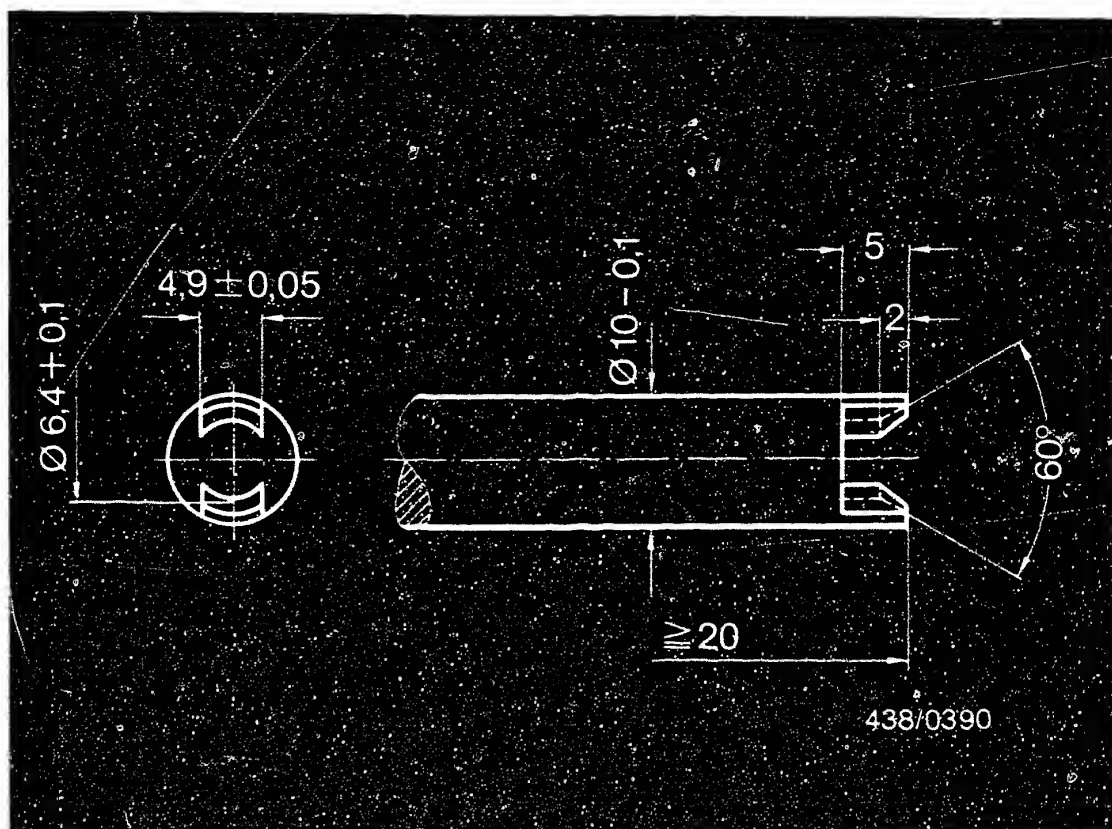


Electric fuel pump Part No. 0 580 254 982 from FD 823  
The non-return valve is screwed into the pressure connection piece of the electric fuel pump.  
In case of leaks, the whole valve insert should be replaced.  
Part No. of the valve insert: 1 587 410 901.

#### Installation:

Thoroughly clean the connection of the delivery line on electric fuel pump.  
Pinch off intake hose (fuel tank - electric fuel pump) (e.g. with hose clamber W 157 of Matra Co.).  
Screw off the delivery line, collecting any escaping fuel.





Unscrew valve insert with screwdriver for slotted shoulder screws (can, if necessary, be made by following sketch above).

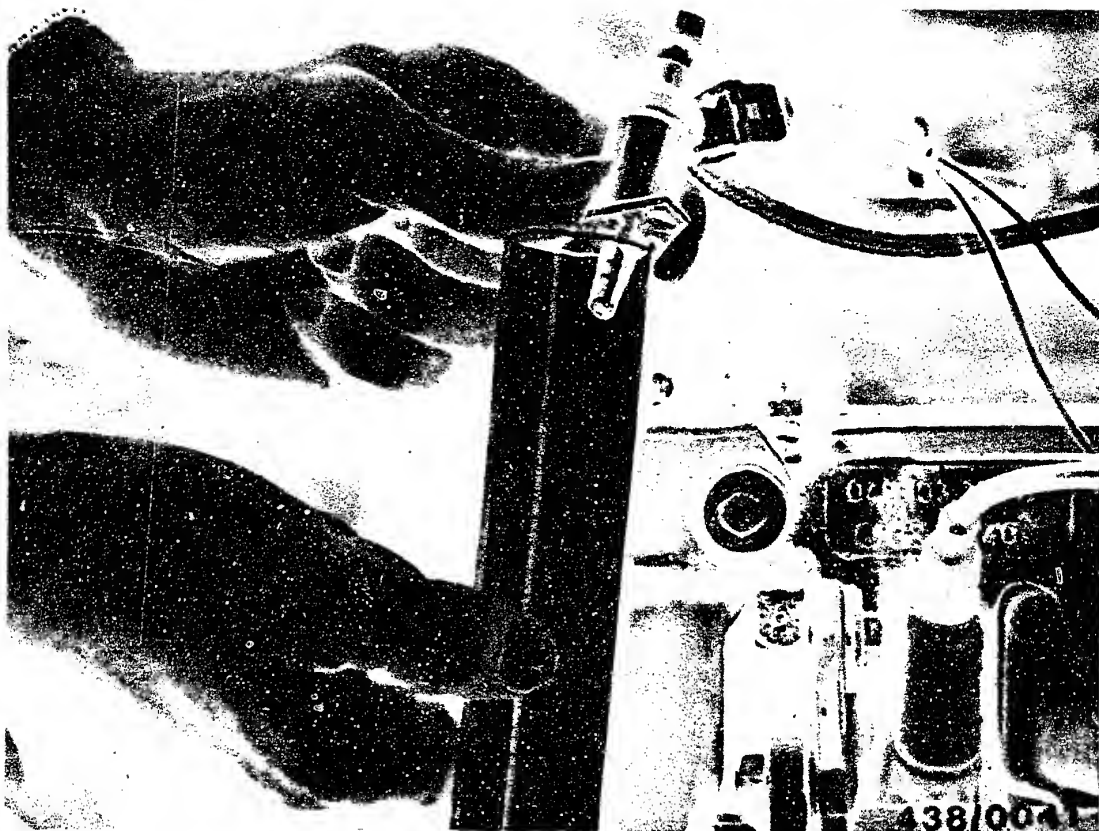
Screw in new valve insert. Do not fasten too tightly. Torque 0.4...0.6 Nm (4...6 kgfcm).

Connect delivery line with new flat seal rings and inlet union.

Remove hose clamber from intake hose.

Check connections for leaks with the electric fuel pump in operation.





- The cold-start valve has a leak

Remove cold-start valve. Hose line remains connected.

Hold start valve in a suitable container (e.g. graduate). Switch on the electric fuel pump by bridging the electrical safety circuit.

Dry off the nozzle of the cold-start valve.

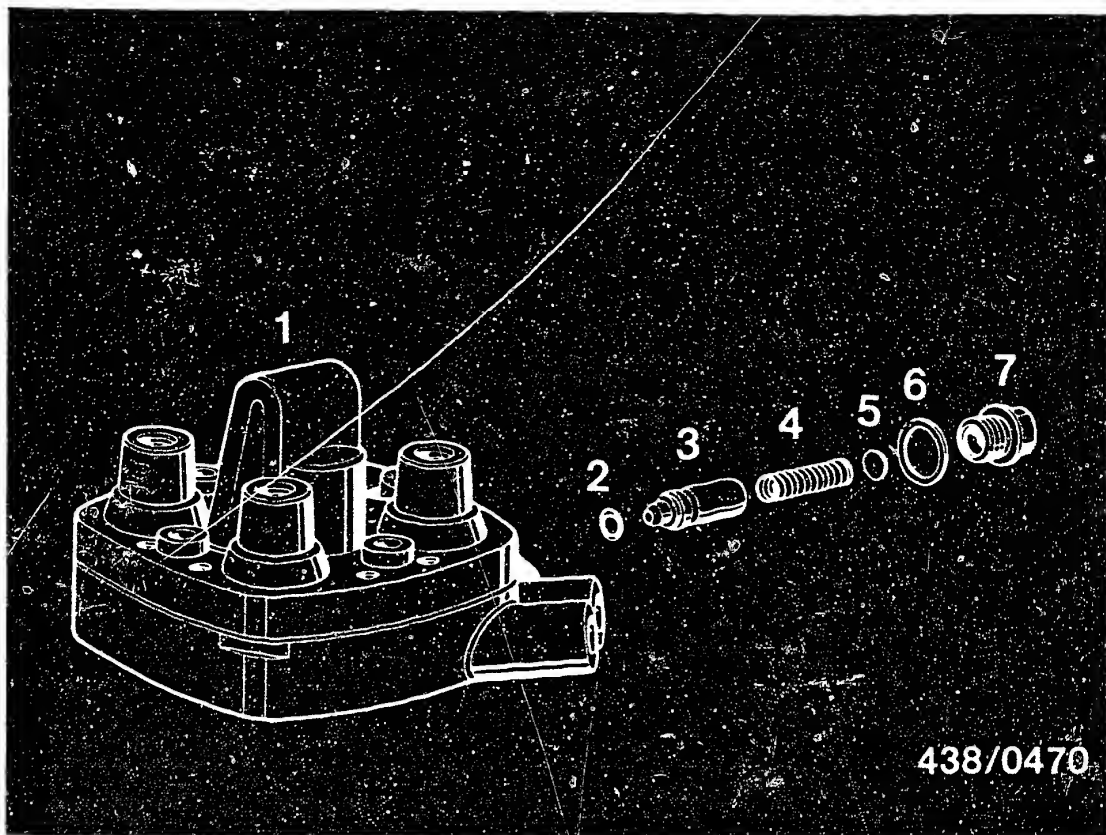
No drops must fall from the nozzle of the start valve within the next minute. Even when shaken and knocked, the start valve must not leak.

Switch the electric fuel pump off again.

Replace the cold-start valve if leaky.

Finally, adjust idle speed with the engine at operating temperature. See Coordinates G 14.





- |                      |                    |
|----------------------|--------------------|
| 1 = Fuel distributor | 5 = Shim(s)        |
| 2 = O-ring           | 6 = Flat seal ring |
| 3 = Control piston   | 7 = Screw plug     |
| 4 = Control spring   |                    |

● Control-piston seal ring (O-ring) of the primary-pressure regulator has a leak.  
Fuel distributor 0 438 100 005

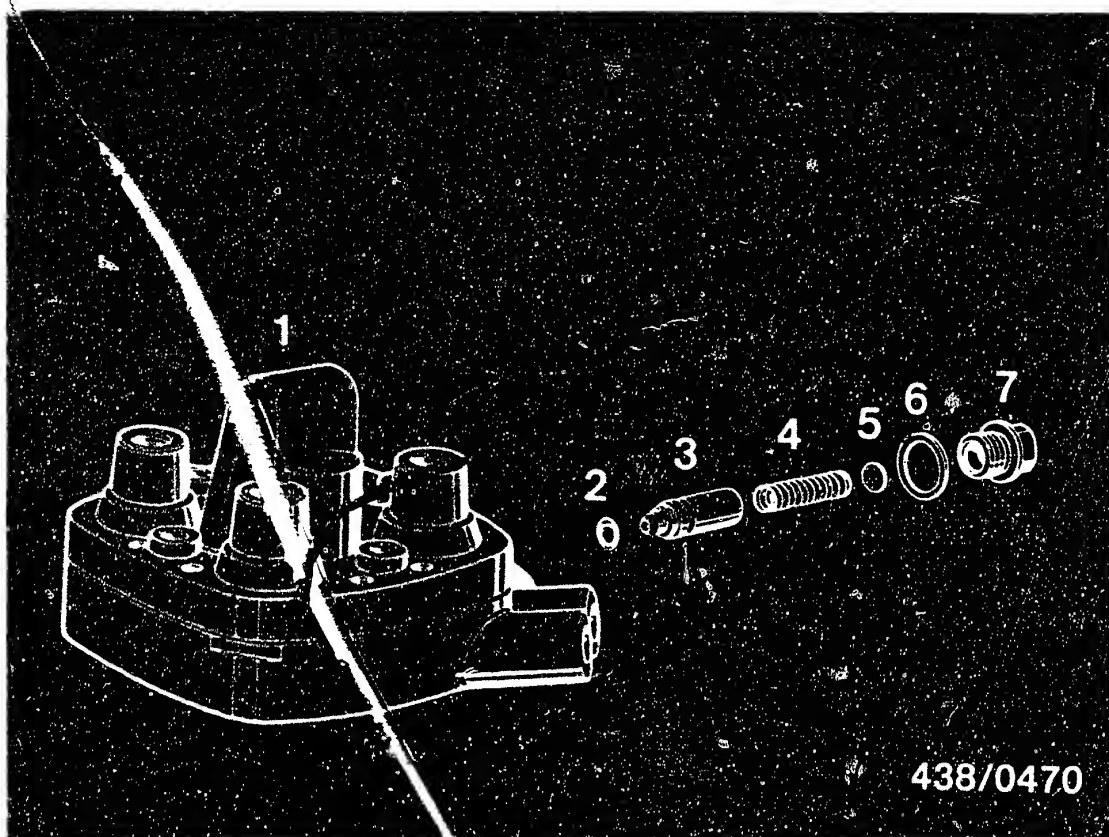
Replace seal ring:  
Clean fuel distributor in the region of the primary-pressure regulator.

Screw out screw plug (pay attention to shims), remove control spring and control piston.

Replace seal ring (O-ring) on control piston (2), install control piston and spring.







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1 = Fuel distributor  
2 = O-ring  
3 = Control piston  
4 = Control spring

5 = Shim(s)  
6 = Flat seal ring  
7 = Screw plug

Screw in the screw plug (7) with shims (5) (the same shims as found when removing) and a new flat seal ring (6).

Finally, check the primary pressure and, if necessary, adjust by changing the shims (5).

Primary pressure:

Fuel distributor 0 438 100 005

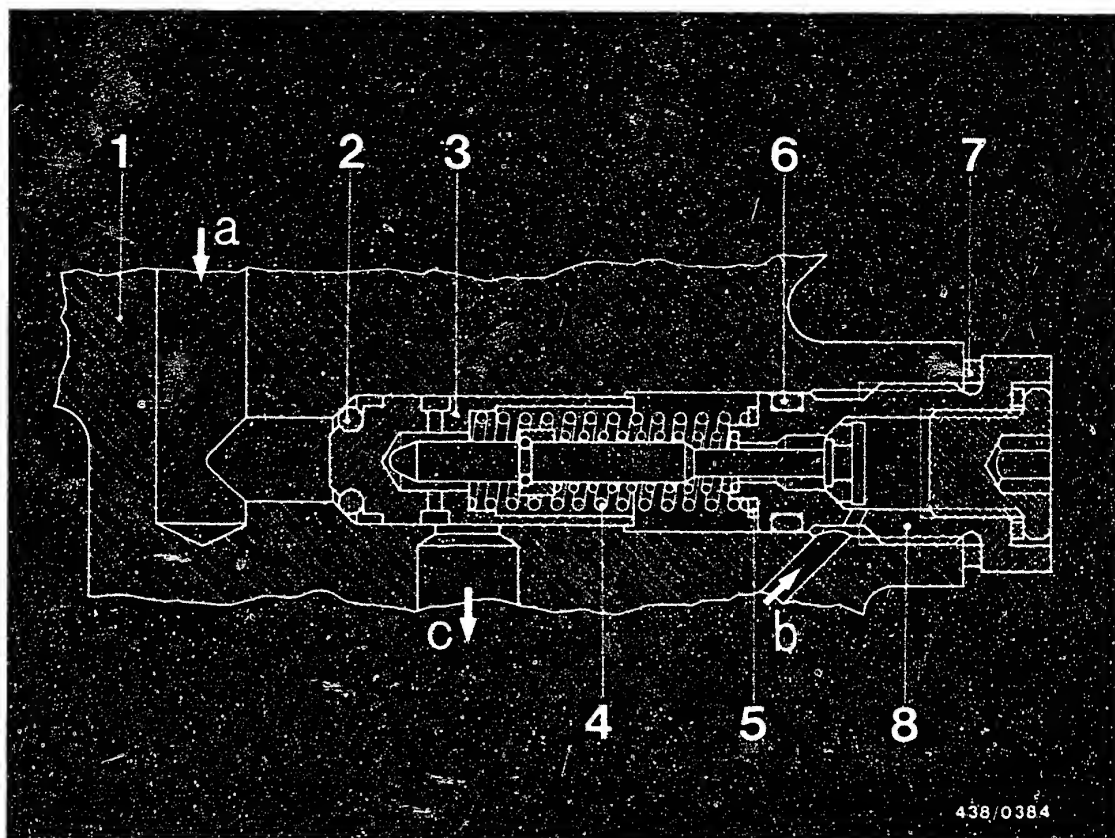
Checking value: 4.5...5.2 bar (4.6...5.3 kgf/cm<sup>2</sup>) gauge pressure

Setting value: 4.7...4.9 bar (4.8...5.0 kgf/cm<sup>2</sup>) gauge pressure

**F1**

Leak test on fuel system  
BMW 320i/520i 4-cylinder engine





438/0384

- |                              |                    |
|------------------------------|--------------------|
| a = Primary pressure         | 4 = Control spring |
| b = From warm-up regulator   | 5 = Shim(s)        |
| c = Fuel return              | 6 = O-ring         |
| 1 = Fuel-distributor housing | 7 = Flat seal ring |
| 2 = O-ring                   | 8 = Screw plug     |
| 3 = Control piston           |                    |

- Seal ring (O-ring) on control piston of primary-pressure regulator has a leak.

Fuel distributor 0 438 100 023

Replace the seal ring.

Clean the fuel distributor in the region of the primary-pressure regulator.



Unscrew the large screw plug (8) with the complete push-up valve. Also remove the shims (5), control spring (4) and control plunger (3).

Replace the seal ring (O-ring) (2) on the control plunger. Install the control plunger and the control spring.

Screw in the screw plug with the complete push-up valve and with shims (as found when removing) and new seal rings (6 and 7).

Finally, check the primary pressure and, if necessary, adjust by changing the shims (5).

Primary pressure:

Fuel distributor 0 438 100 023

Checking value 4.5...5.2 bar (4.6...5.3 kgf/cm<sup>2</sup>) gauge pressure

Setting value 4.7...4.9 bar (4.8...5.0 kgf/cm<sup>2</sup>) gauge pressure





#### 16.5 Possible causes of trouble in the control-pressure circuit

- 1976 model:

Fuel distributor 0 438 100 005 without push-up valve

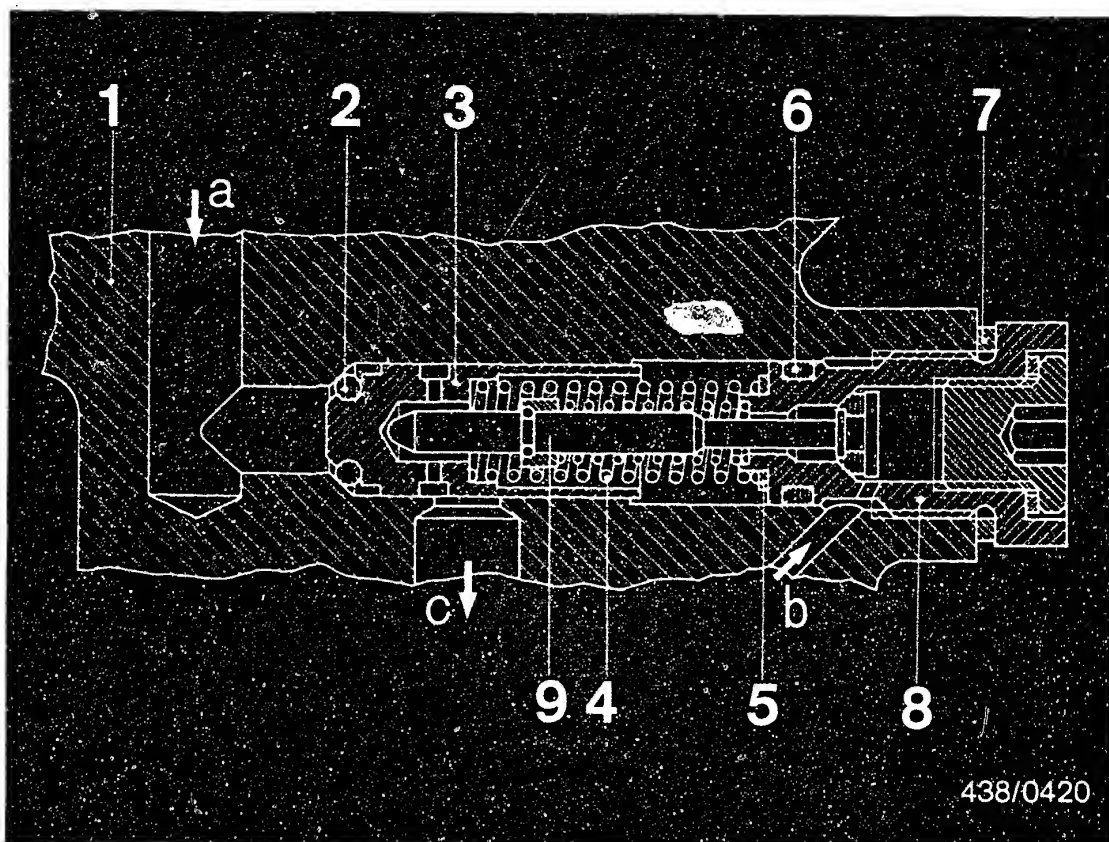
In this case, the only possible cause of a leak in the control-pressure circuit is the warm-up regulator (arrow).

Therefore, replace the warm-up regulator.

Note: Thoroughly clean fuel connections before loosening.

When re-connecting, always use new seal rings..





- |                              |                    |
|------------------------------|--------------------|
| a = Primary pressure         | 4 = Control spring |
| b = From warm-up regulator   | 5 = Shim(s)        |
| c = Fuel return              | 6 = O-ring         |
| 1 = Fuel-distributor housing | 7 = Flat seal ring |
| 2 = O-ring                   | 8 = Screw plug     |
| 3 = Control piston           | 9 = Push valve     |

● As from 1977 model:

Fuel distributor 0 438 100 023 with push valve.

The push valve (9) in the primary-pressure regulator has a leak.

Since the seal ring of the push valve is rigidly vulcanized onto the valve needle, the whole push valve (ready-assembled unit) must be changed.

This also applies when replacing earlier versions of the push-up valve with a loose O-ring on the valve needle. The O-ring is no longer obtainable as a separate part. Therefore, if necessary, always install the complete valve unit.

Clean the fuel distributor in the region of the primary-pressure regulator. Unscrew the large screw plug (8) with the complete push-up valve. Pay attention to the control spring (4) and the shims (5).

Screw in the new push-up valve with the previously found number of shims (5), a new O-ring (6) and flat seal ring (7).

Then check the primary pressure once again and, if necessary, adjust by changing the shims (5).

Test specifications and settings for the primary pressure:

Fuel distributor 0 438 100 023.

Checking value 4.5...5.2 bar (4.6...5.3 kgf/cm<sup>2</sup>) gauge pressure

Setting value 4.7...4.9 bar (4.8...5.0 kgf/cm<sup>2</sup>) gauge pressure



## 17. Testing the injection valves.

Remove the injection valves for testing.

When loosening the fuel lines, apply counter-force at the fixed hexagon of the injection valves.

When refitting the injection valves, it is best to replace the O-rings on the valve stem (BMW service part) in order to prevent leaks and thus the entry of unmetered air.

### 17.1 Test equipment and test media

The following testing specification refers to valve testers KDJE-P400 (previously KDEP 7452) and 0 681 200 700.

Observe the test-media specification!

Test media: Calibrating fluid (Shell K 30, Esso-Varsol, Shell Mineral Spirits 135)

or

Bosch Part No. VS 14 942-CH

Former Part No. 5 973 340 650

The calibrating fluid can be obtained in 5 l metal cans from the following supplier:  
Firma

Oskar Gnam GmbH & Co

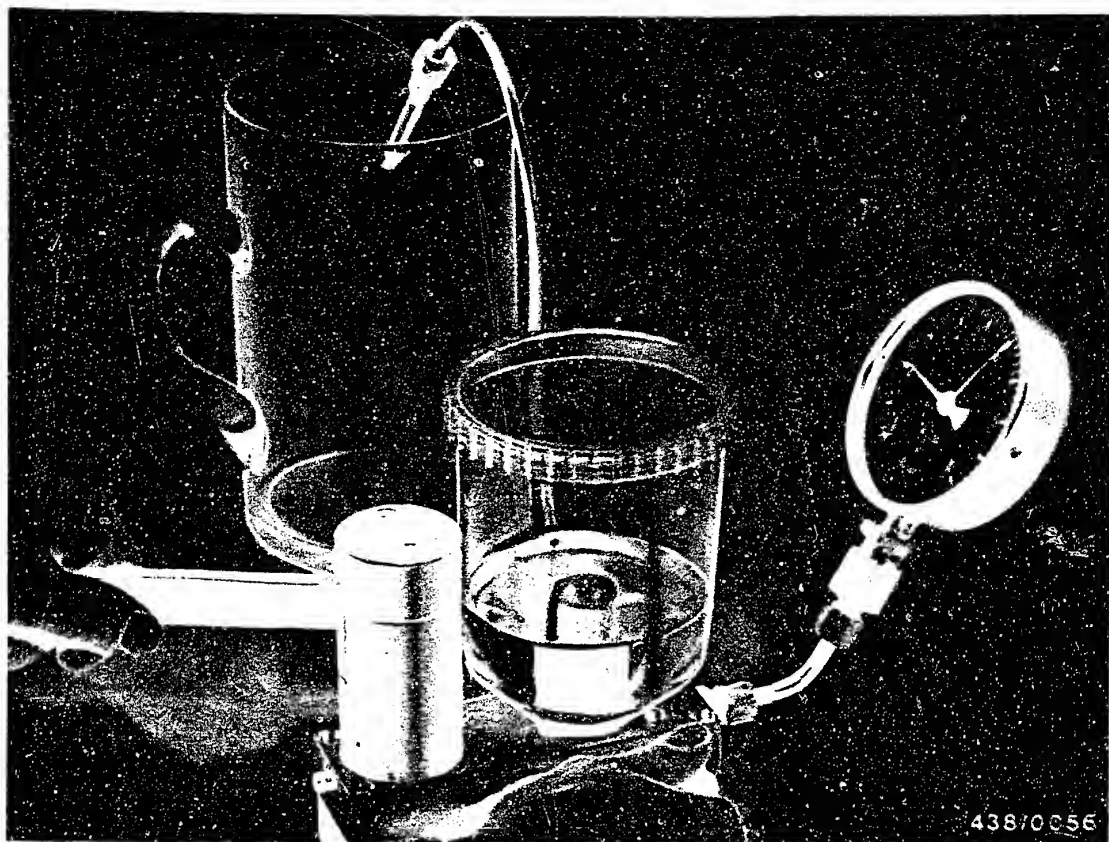
D-7531 Kämpfelbach-Bilfingen

### Caution:

For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids. Even with calibrating fluid, be sure to observe the local official regulations.







### 17.2 Connecting the injection valve to the tester

Connect the injection valve to the valve tester and bleed the delivery line by operating the lever several times with the union nut open. Then tighten the union nut.

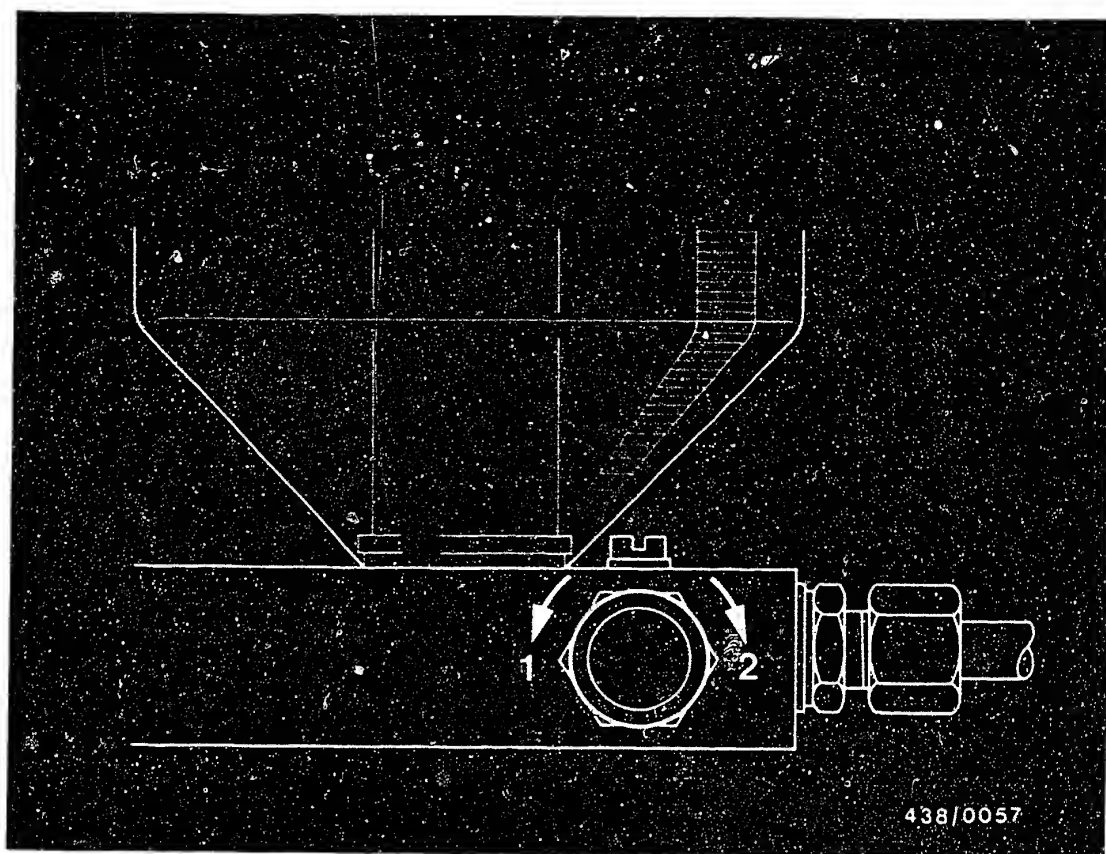
### 17.3 Checking for dirt

Move the hand lever slowly (about 2 seconds per stroke) back and forth with the stopcock on the pressure gauge open. If the pressure does not build up to 1...1.5 bar gauge pressure, the injection valve has a bad leak (caused, for example, by dirt stuck in it).

You can try to flush the injection valve clear by moving the lever back and forth several times strongly.

If this attempt is successful, continue the test. If it is not possible to flush the valve clear, replace it.



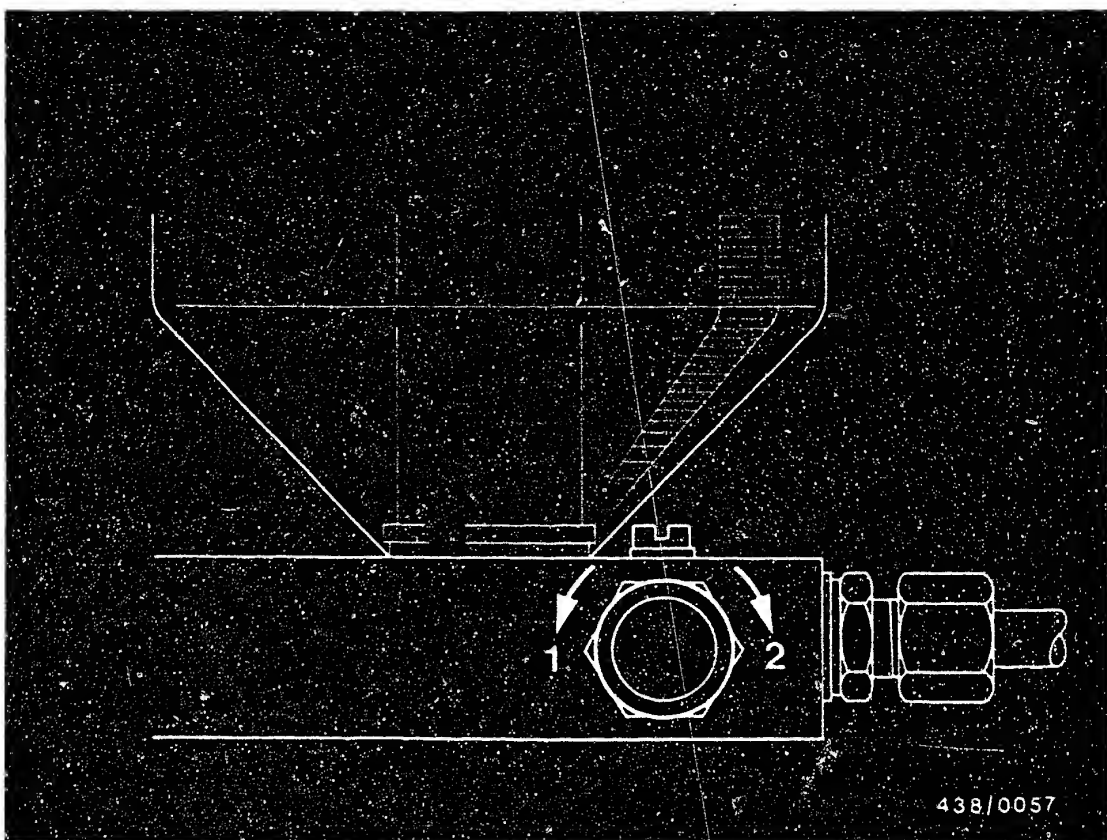


1 = Open

2 = Close

#### 17.4 Testing the opening pressure

Injection valve Part No.	Test specifications - opening pressure (gauge pressure)
0 437 502 007:	<u>2.5...3.6 bar</u> (2.6...3.7kgf/cm <sup>2</sup> )



With the stopcock closed, flush the valve out and bleed it with several rapid movements of the lever. Open the stopcock and test the opening pressure by moving the lever slowly (about 2 seconds per stroke).

If the opening pressure is outside tolerance, replace the injection valve. Individual valves can also be interchanged within a set.

### 17.5 Leakage test

Open the stopcock, build the pressure up slowly to a value 0.5 bar under the opening pressure determined previously (but not less than 2.3 bar gauge pressure), and hold it constant at that level. No drops must now fall from the valve for the next 15 seconds.





438/0058

#### 17.6 Chatter test, evaluation of spray

Move the lever back and forth at about 1 stroke per second. As this is done, the valve must chatter. No drops of fuel must form at the mouth of the valve. The valve must not produce a "cord spray". Formation of a single-sided, atomized spray within an overall spray angle of about  $35^\circ$  is permissible (see example given in illustrations).

Illustration shows good spray formation.





43810059

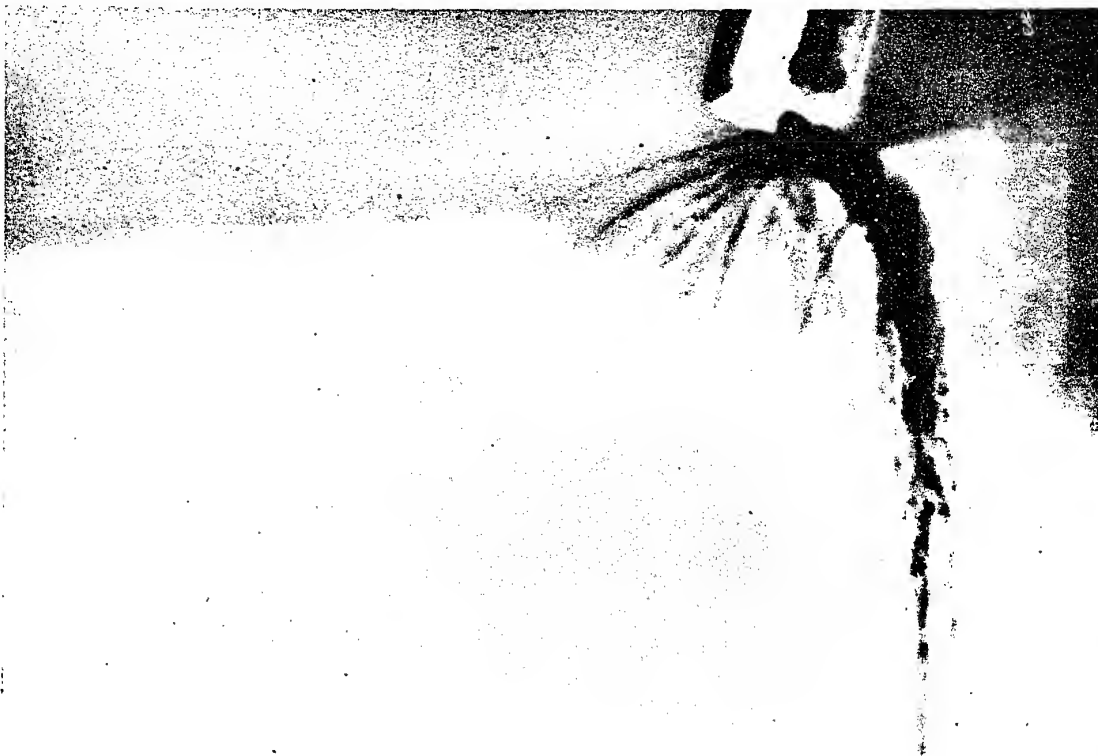
Illustration shows single-sided but nevertheless good spray formation.

**F12**

Testing the injection valves

BMW 320i/520i 4-cylinder engine





438/0060

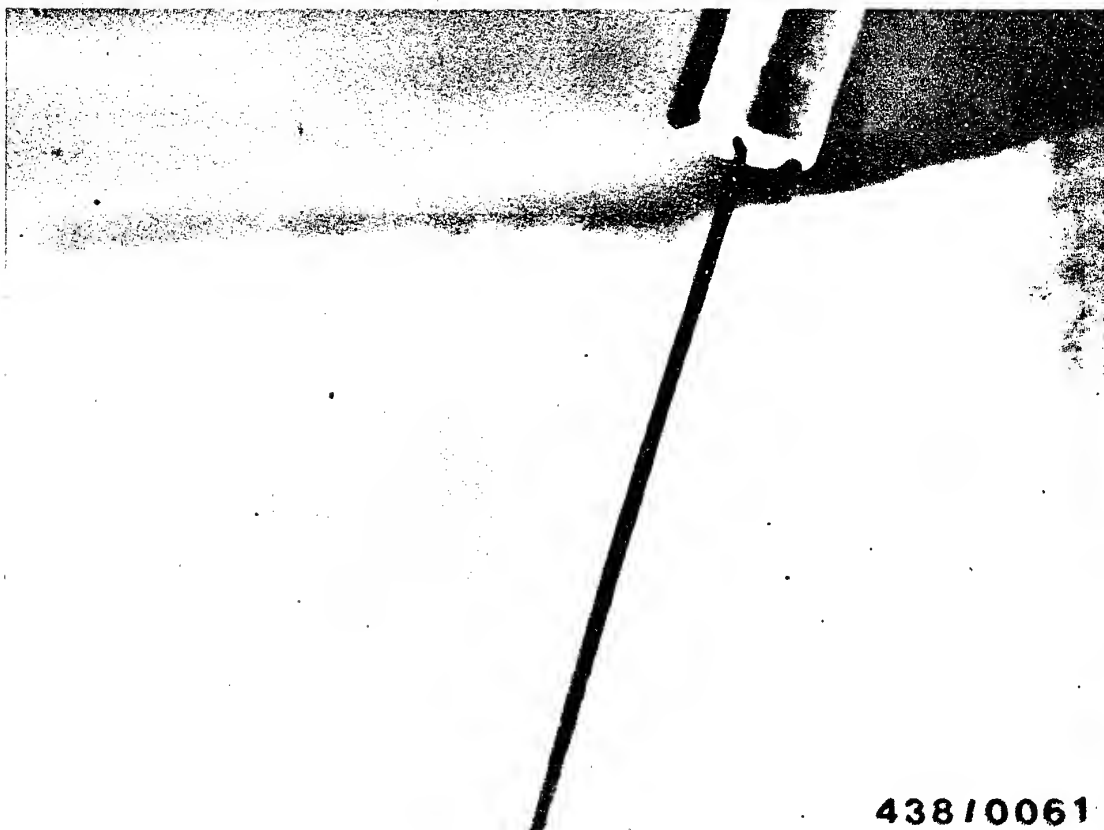
Poor spray formation; replace injection valves.

Illustration shows drop formation.

**F13**

Testing the injection valves  
BMW 320i/520i 4-cylinder engine





438/0061

Poor spray formation; replace injection valves.

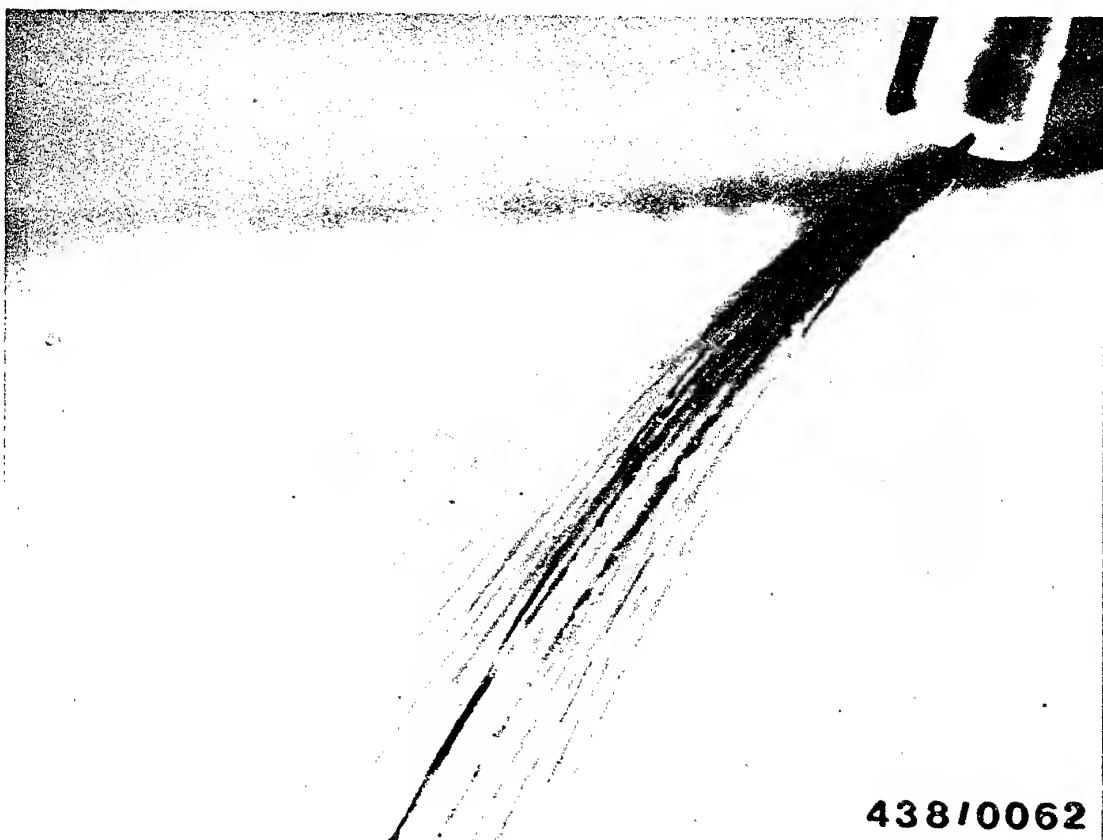
Illustration shows "cord" spray.

**F14**

Testing the injection valves  
BMW 320i/520i 4-cylinder engine







438/0062

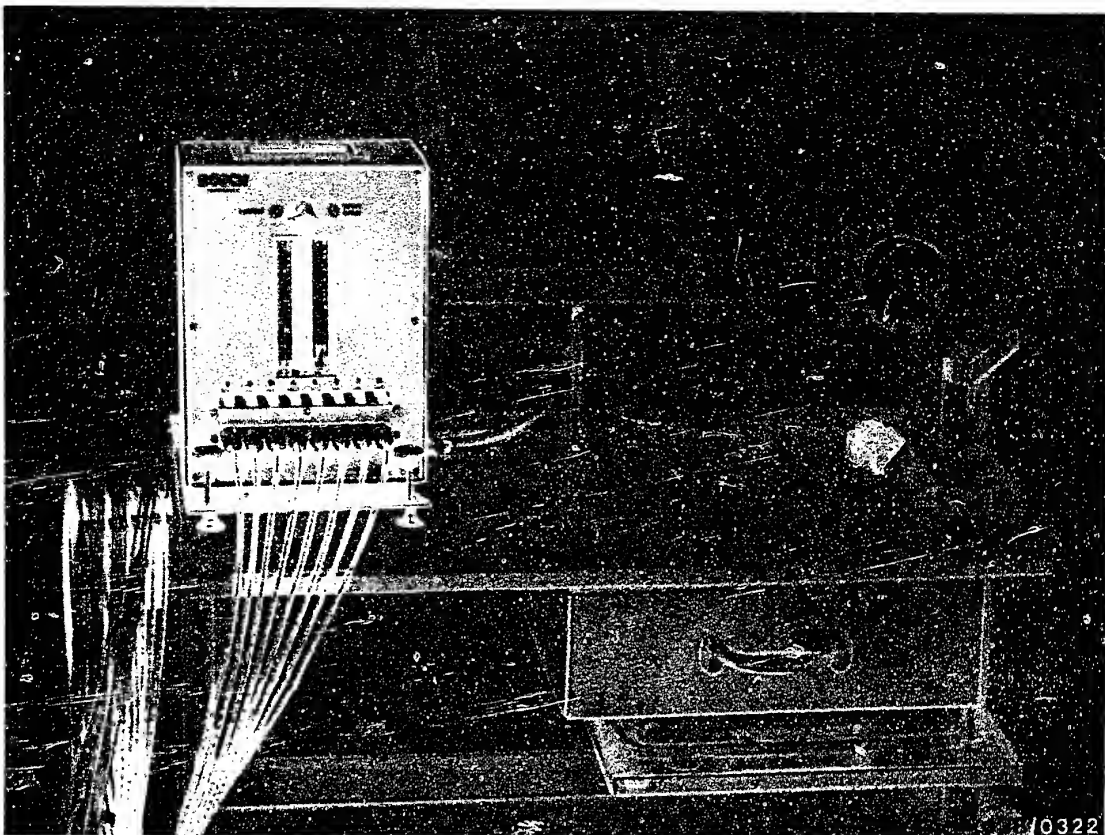
Poor spray formation; replace injection valves.

Illustration shows "spray in strands".

If defective injection valves have been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinates G 14.





## 18. Comparative measurement of fuel delivery of fuel distributor outlets.

This test is carried out using the tester for delivered quantity comparison KDJE-P 200 (previously KDJE 7451).

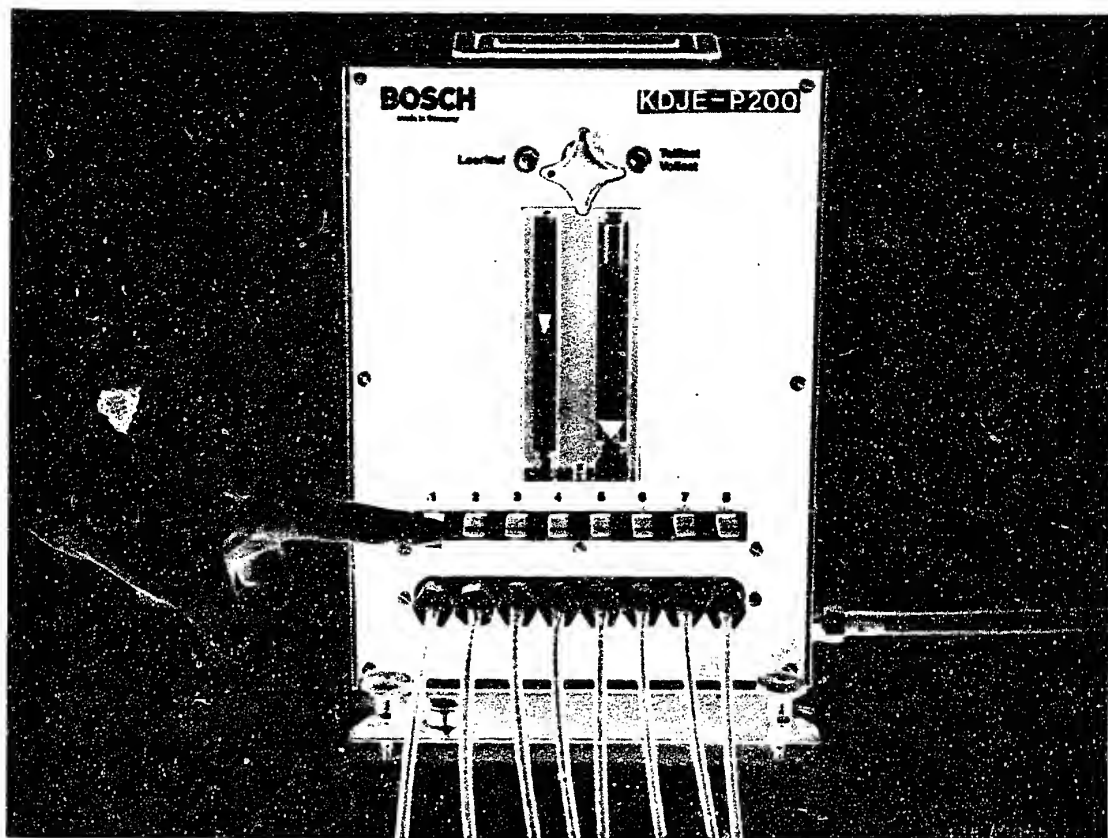
### 18.1 Application

By means of comparative measurements, the differences in the amounts of fuel delivered from the individual outlets on the fuel distributor are determined.

The tester is designed so that the test can be made on the vehicle without having to remove the fuel distributor.

Since the test is made with the original injection valves, the operator can recognize at the same time whether delivered-quantity scatter, if it occurs, is caused by the fuel distributor or by the injection valves.





- 1 = 3-way cock
- 2 = Small rotameter tube
- 3 = Keyboard for 8-way valve
- 4 = Adjusting screw for setting up
- 5 = Spirit level
- 6 = Large rotameter tube
- 7 = Return hose
- 8 = Polyamide hose lines (test lines)

### 18.2 Construction

The tester is designed for use with all engines, up to 8 cylinders, equipped with K-Jetronic.



Basically, the tester consists of a steel housing containing 2 rotameter tubes with measuring ranges of 2...15 cm<sup>3</sup> and 10...180 cm<sup>3</sup>, an 8-way valve for key operation (Item 3) and a 3-way stopcock (Item 1).

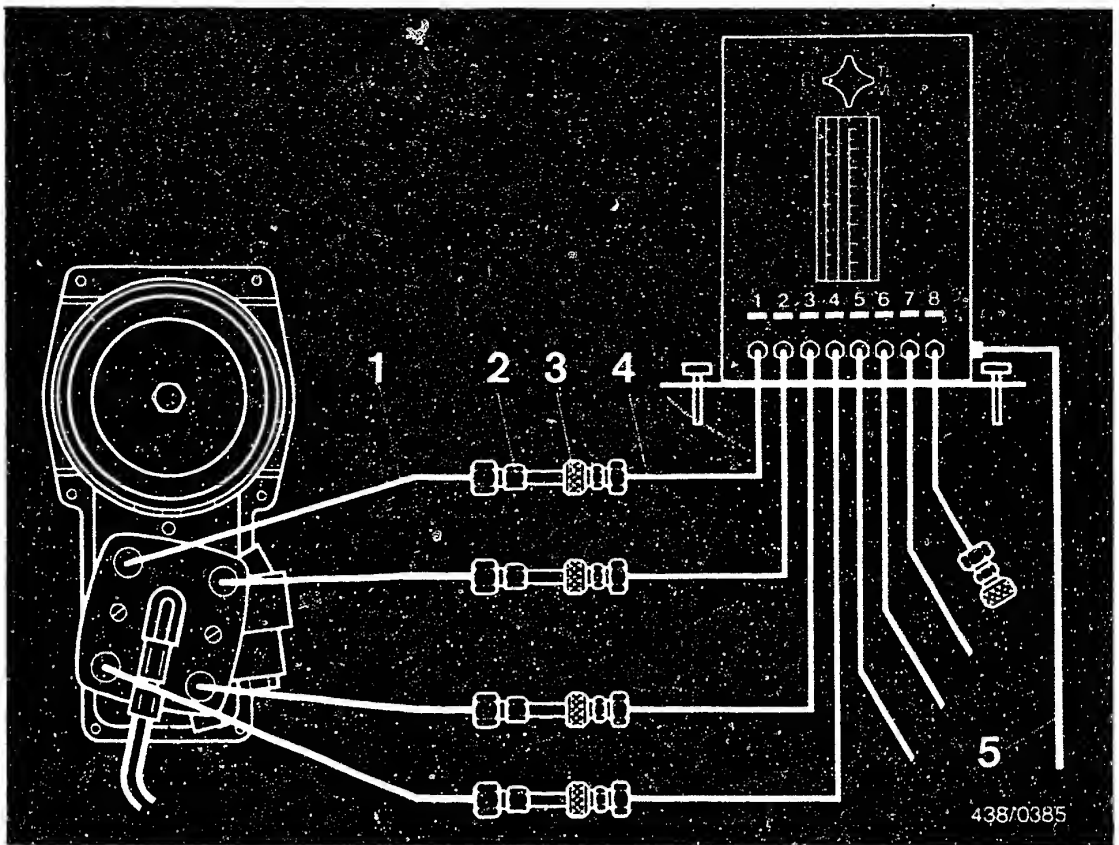
The small rotameter tube (Item 2) is used for the idle measurement while the large tube (Item 6) is used to measure the fuel delivery at part- and full-load. The particular rotameter tube to be used is connected by means of the 3-way stopcock. Using the 8-way valve, the fuel delivery of each cylinder is tested one after the other.

Attached to the tester are 8 hoses (Item 8), each terminated with an automatic connector. When the injection valves are withdrawn from their sockets on the engine they are attached to these connectors. Each automatic connector is fitted with a push valve so that no fuel can escape from connectors that are not in use (when 4- or 6-cylinder systems are tested).

The fuel is returned to the fuel tank through a hose (Item 7) about 5 m long.

The entire test is made with a closed circuit, i.e. no fuel escapes.





- 1 = Fuel distributor injection tubing
- 2 = Injection valves
- 3 = Automatic connectors
- 4 = Tester hoses
- 5 = Return line to fuel tank filler neck

### 18.3 Setting up and connecting the tester:

Set the tester up beside the engine on a solid base (e.g. on tester trolley KDJE-W 100) and align it with the built-in spirit level at the base of the tester.



Remove injection valves. The injection tubing remains connected.

Before refitting the injection valves check the seals on the valve stem to see whether they are deformed or damaged. If need be, use new seals (BMW service parts) in order to prevent leaks and thus the entry of unmetered air.

Clean the injection valves with a rag and insert injection valves in correct sequence into the automatic connectors of the first four tester hoses.

Note:

Insert the injection valves as far as they will go and tighten the knurled thumbscrews well so that the non-return valves of the automatic connectors are open fully. Introduce the return hose of the tester into the fuel tank filler neck.

18.4 Bleeding the tester:

Remove the rubber hood so that air-flow sensor plate becomes accessible.

Remove the electric plugs from the warm-up regulator and the auxiliary-air device.

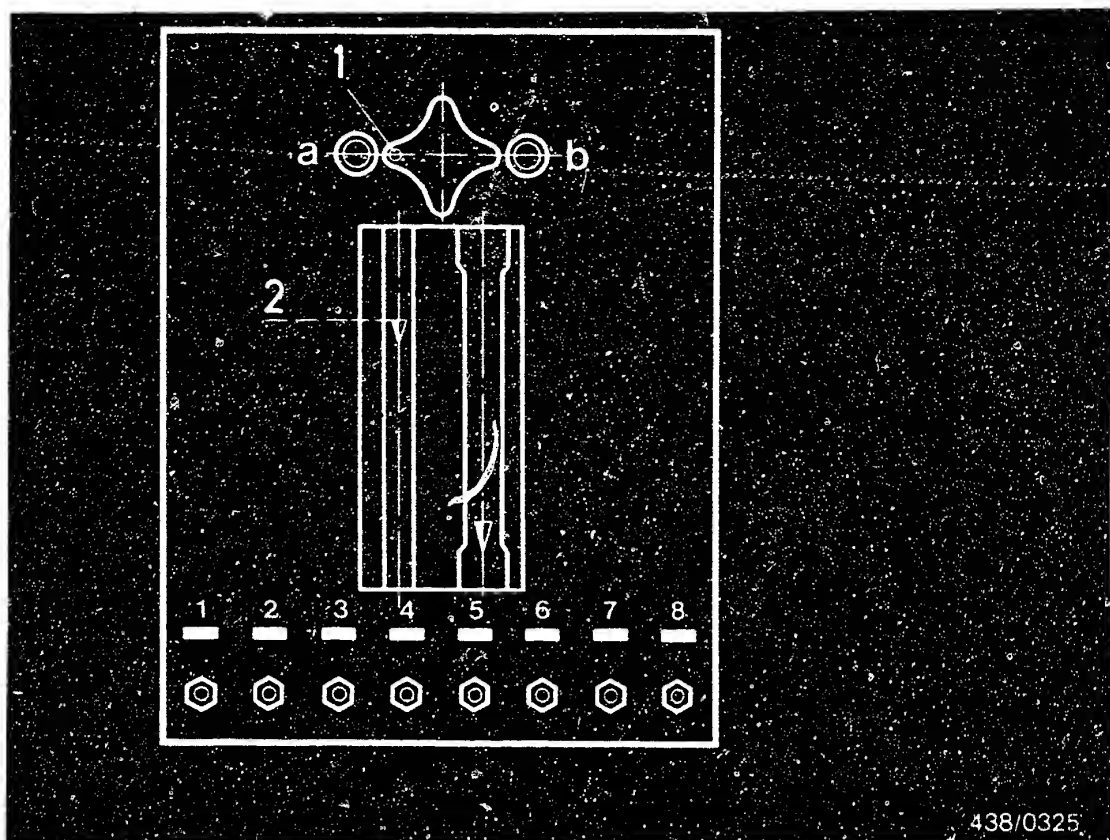
Switch on the electric fuel pump by bridging the electrical safety circuit.

Raise the air-flow sensor plate to the stop.

Press the keys on the 8-way valve one after the other, while simultaneously switching the 3-way stopcock until both rotameter tubes are bled.

Return the sensor plate to the rest position.





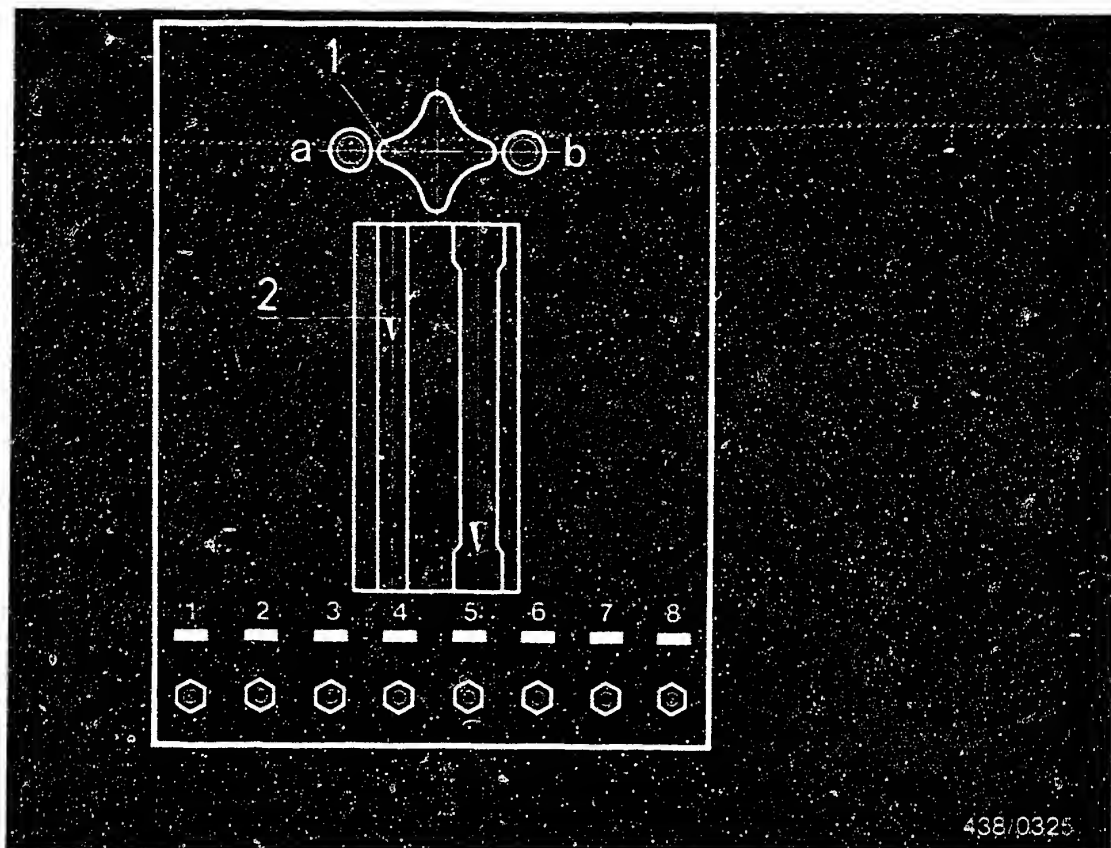
1 = White dot                      a = Idle  
 2 = Measuring line              b = Part load/full load

### 18.5 Testing

The flow comparison measurement is made in the idle, part-load and full-load ranges.

The small rotameter tube is to be used for the idle measurement (white dot to the left on control knob); part-load and full-load measurements are made using the large rotameter tube (white dot to the right).





438/0325

1 = White dot  
2 = Measuring line

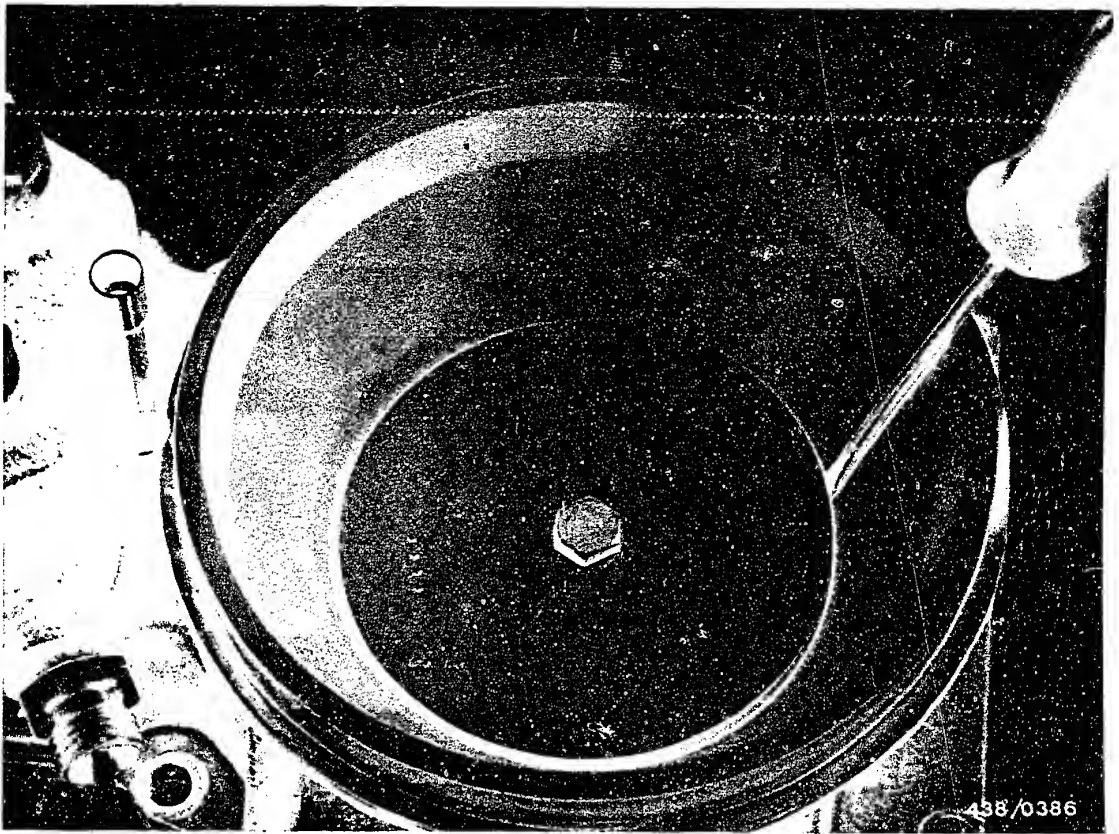
a = Idle  
b = Part load/full load

The delivered quantities indicated on the rotameter tubes are read off at the top edge of the conical float (Item 2). On testers with a ball float the uppermost point of the ball is used for reading off. With each measurement be sure to wait until the float has reached its final position. This may take 20 ... 30 seconds in the case of small deliveries.

**G7**

Comparative measurement of fuel delivery  
BMW 320i/520i 4-cylinder engine





The exact setting and locating of the position of the air-flow sensor plate for the various load ranges is done using a screwdriver (a small one for the idle position), which is inserted to an appropriate depth between the air funnel and air-flow sensor plate.

**G8**

Comparative measurement of fuel delivery  
BMW 320i/520i 4-cylinder engine



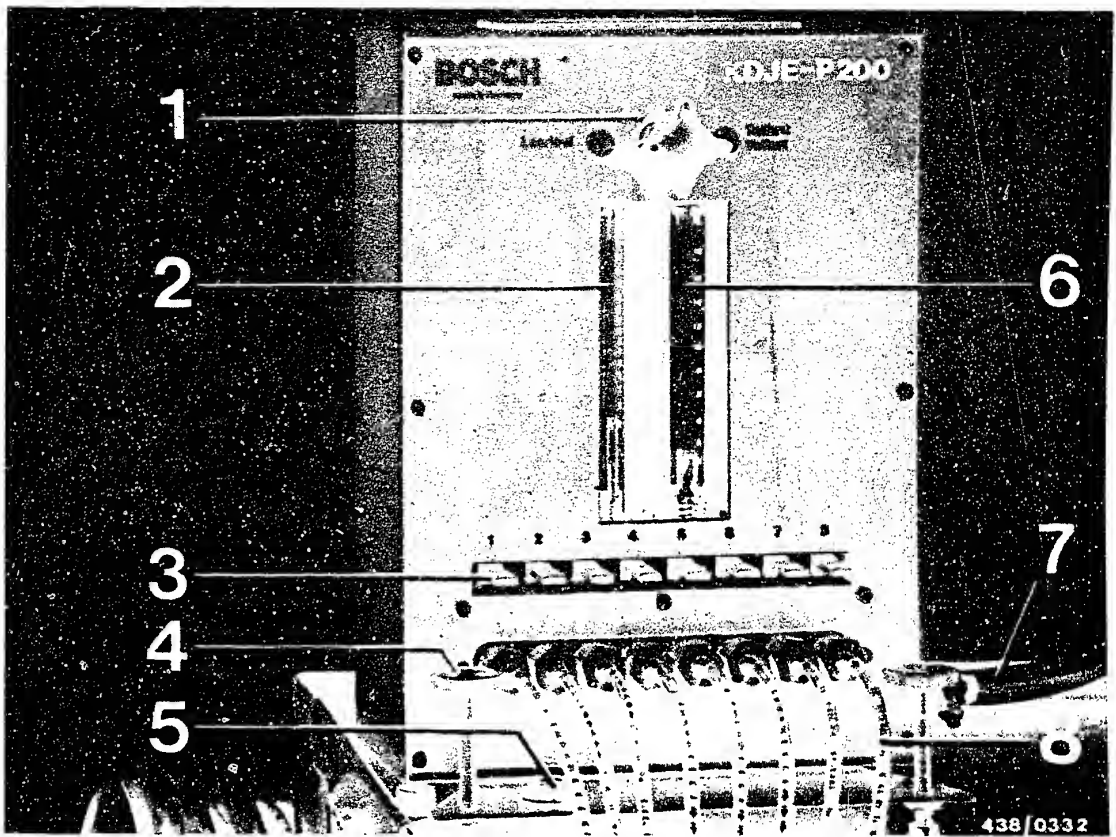
Procedure:

Switch on the electric fuel pump by bridging the electrical safety circuit.

Fixed numerical values are specified in the following test section for the maximum permissible fuel delivery differences for the individual load ranges.

The "setpoint" value always pertains to the fuel-distributor outlet with the lowest fuel delivery, i.e. in each case the outlet with the lowest delivery is to be first ascertained.





Press the key for outlet 1. Pivot the air-flow sensor plate until the corresponding rotameter tube approximately indicates the "set point" value. Fix the air-flow sensor plate in this position.

Test the remaining outlets in order to determine which outlet has the lowest fuel delivery.

Press the key for this outlet again, and set the delivery precisely to the "set point" by correcting the position of the air-flow sensor plate. Then fix the air-flow sensor plate in this position again.

Press the remaining keys one after the other, and determine the maximum fuel delivery of each outlet. A deviation in fuel delivery can only be above the "set point".

## 18.6 Test specifications

Fuel distributor Q 438 100 005 0 438 100 023	Set point (cm <sup>3</sup> /min)	Max. permissible fuel delivery (cm <sup>3</sup> /min)
Idle	6.0	6.8
Part load	40.0	44.0
Full load	160.0	175.0

If, in testing, a too large difference is ascertained in one of the three load ranges, the test should for safety's sake be repeated.

If the result is confirmed, you should check whether the fault lies in the fuel distributor or in the injection valves.

To do this interchange the injection valves with the greatest and smallest difference.

If the result is still the same, the fault is in the fuel distributor. If the fault follows the interchanged injection valves, it lies in the injection valves.

Change defective fuel distributor and/or replace defective injection valves.



## 18.7 Modifications to K-Jetronic equipment

### Fuel distributor

The 320i and 520i models were fitted up to model year 76 with fuel distributor 0 438 100 005 without push-up valve. As of model year 77 fuel distributor 0 438 100 023 with push-up valve has been used.

If necessary, fuel distributor 0 438 100 005 can be replaced by ..023. To do this, it is necessary to make a conversion with the following parts:

Fuel distributor 0 438 100 023

BMW parts:

Qty.	Description	BMW Part Number
1	Line	13 31 1 264 815
1	Line	13 31 1 264 739
4	Inlet-union screw	13 53 1 264 360
1	Inlet-union screw	13 31 1 264 830
1	Inlet union	13 31 1 263 262
10	Seal ring	07 11 9 963 042
2	Seal ring	07 11 9 963 072
4	Seal ring	07 11 9 963 129
1	Fuel hose 7.5 $\phi$	13 31 1 265 771
1	Inlet-union screw	13 31 1 265 734

### Installation instructions:

The line with the end number ..815 goes from the warm-up regulator return to the push-up valve in the fuel distributor. Line ..739 goes from the fuel distributor to the start valve. Fuel hose ..771 goes from the fuel distributor return to the metal pipe of the return.



### 18.8 Final operations:

Check the seal rings on the stem of the injection valves for damage and deformation. If necessary, use new seal rings (BMW service part).

Re-fit the injection valves properly. Also fit the rubber dome. Make sure that all lines are laid correctly.

Re-connect the electrical safety circuit of the K-Jetronic properly.

Use a trial run to check that there are no leaks in line connections.

Finally, check the idle adjustment and correct if necessary.

Idle adjustment is described on Coordinates G 14.





## 19. Idle adjustment

### 19.1 Test conditions:

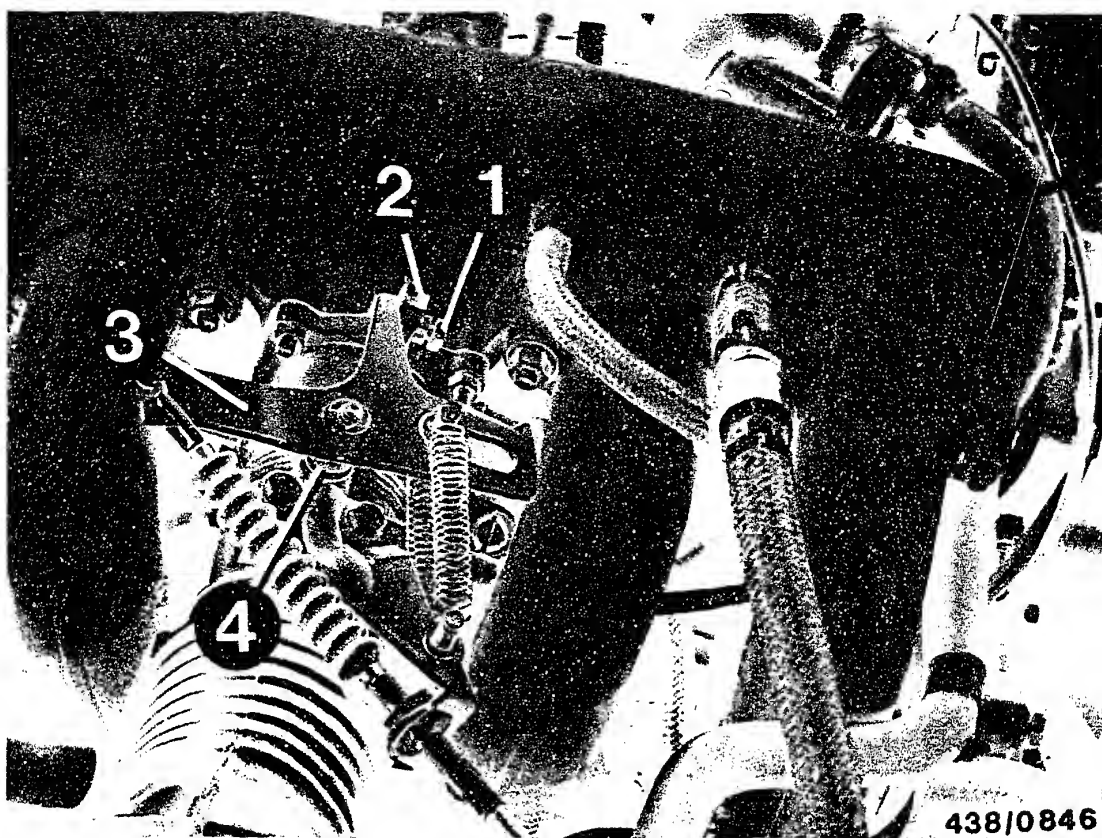
Warm up the engine for the idle adjustment

#### Important:

- If fuel-injection lines or injection valves have been loosened or removed, warm up the engine under load. The low fuel throughput at idle is not always sufficient to bleed the fuel-injection lines.
- The idle adjustment must not be carried out when the engine is too hot, e.g. immediately after the engine has been raced or after a power measurement on the roller-type test stand.
- In vehicles with an air conditioner, switch the air conditioner off when performing the idle adjustment in order to stabilize the engine speed.

Measure the engine speed with a separate tachometer.





438/0846

● Check whether the throttle-plate lever is up against the idle stop. The cable must be adjusted so that it is free of tension.

If necessary, make a basic setting as follows:

Unhook the throttle cable.

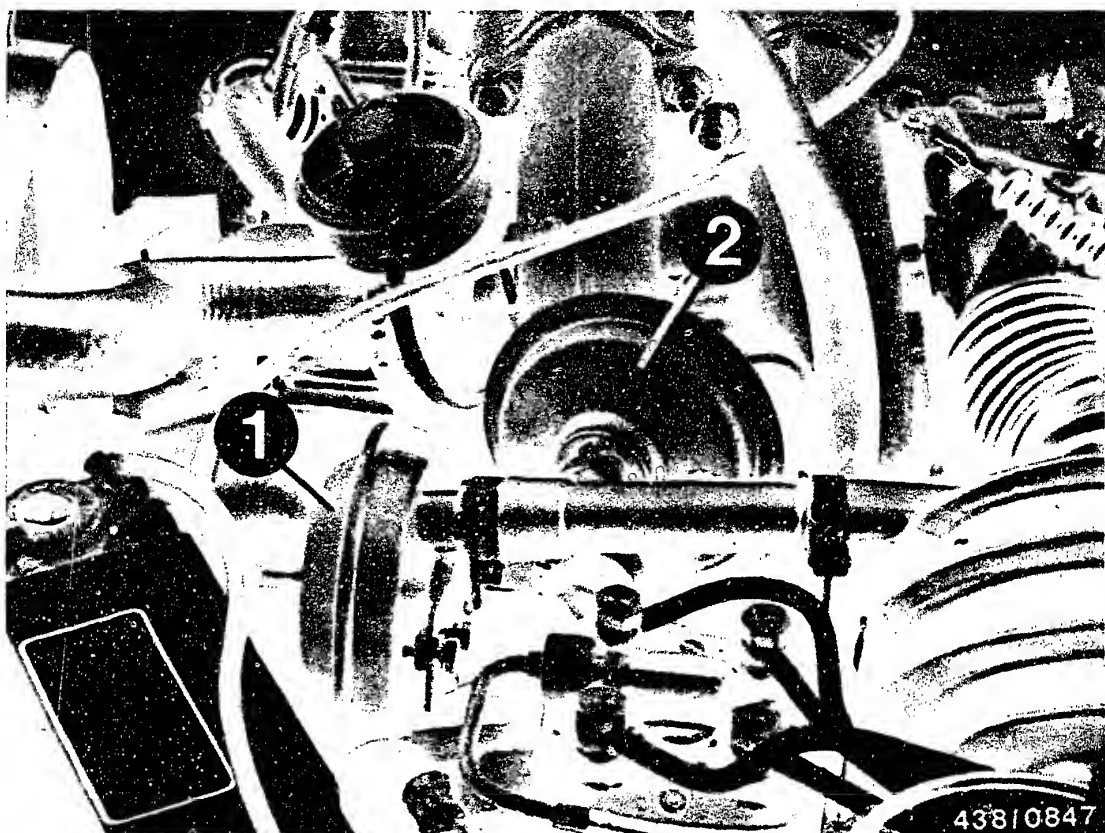
Adjust the stop screw (1) so that there is a gap of 0.5...1.0 mm between stop (2) and lever (3).

Loosen clamping screw (4) under lever (3).

Bring the throttle valve in the housing up against its stop with zero play and tighten the clamping screw (4).

Screw in the stop screw (1) by one turn so that the throttle valve cannot stick or jam. Lock the stop screw and hook in the throttle cable.





- 1 = Vacuum limiter  
2 = Auxiliary-air valve

### 19.2 Further test conditions for engines of the Sweden model

These engines are equipped with vacuum limiter and auxiliary-air valve.  
Both components must be rendered inoperative before making the idle adjustment.



- Checking the vacuum limiter

The vacuum limiter is a vacuum-controlled auxiliary-air valve which only opens on the overrun. In all other operating conditions the vacuum limiter must be tightly closed.

A leak test can be performed as follows:  
Measure the idle speed with the vacuum limiter connected (engine at normal operating temperature). Then switch off the engine.

Remove the vacuum hose from the fitting on the vacuum limiter and seal off tight.

Start the engine again and measure the idle speed. It must not differ from the previous measurement. If the engine speed has dropped, the vacuum limiter has a leak. If it is leaking badly, the idle speed is too high and can no longer be adjusted.

Replace the vacuum limiter if leaking.



### ● Checking the auxiliary-air valve

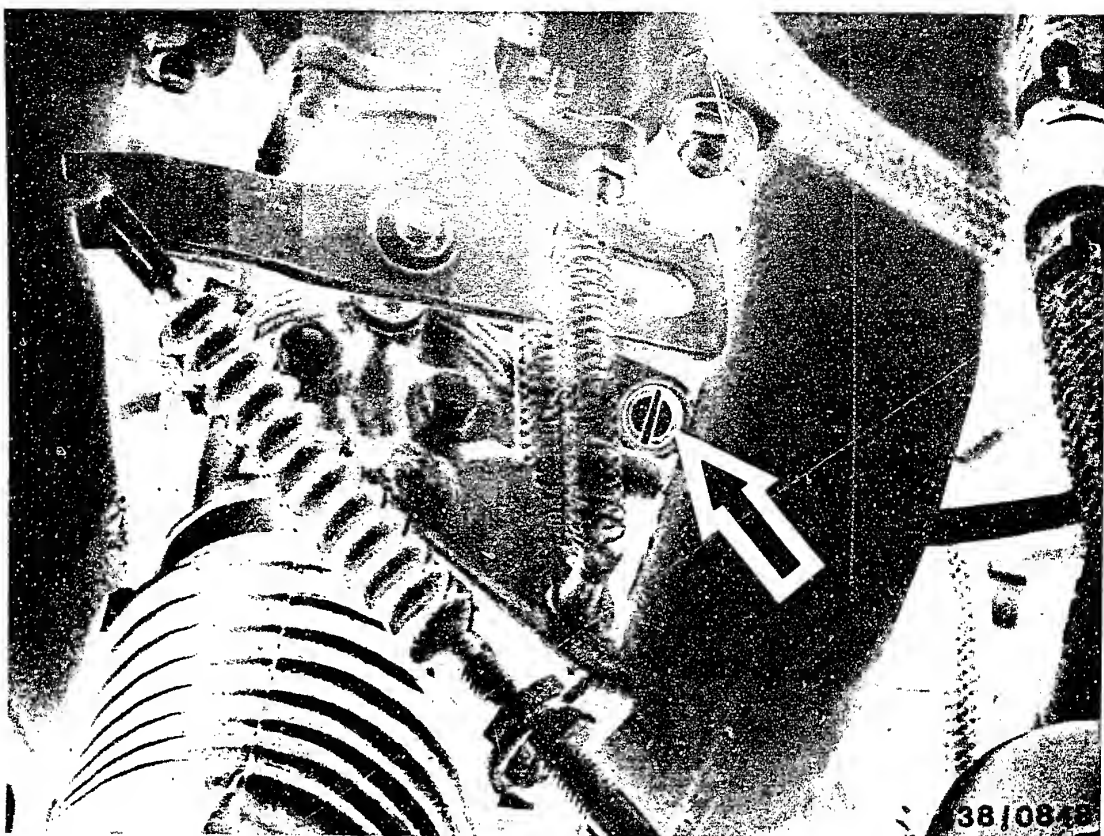
The auxiliary-air valve opens briefly when the engine is being started and is closed at idle and part load. At high load and full load the valve is open. It is controlled by the vacuum acting on the diaphragm.

#### Testing:

Measure the idle speed with the auxiliary-air valve connected (engine at normal operating temperature). Switch off the engine and pull the air hose out of the rubber dome. Seal off the hose and the fitting tight. Start the engine again and measure the idle speed. It must not differ from the previous measurement. If the engine speed has dropped, the auxiliary-air valve has a leak. If it is leaking badly, the idle speed is too high and can no longer be adjusted.

Replace the auxiliary-air valve if leaking.

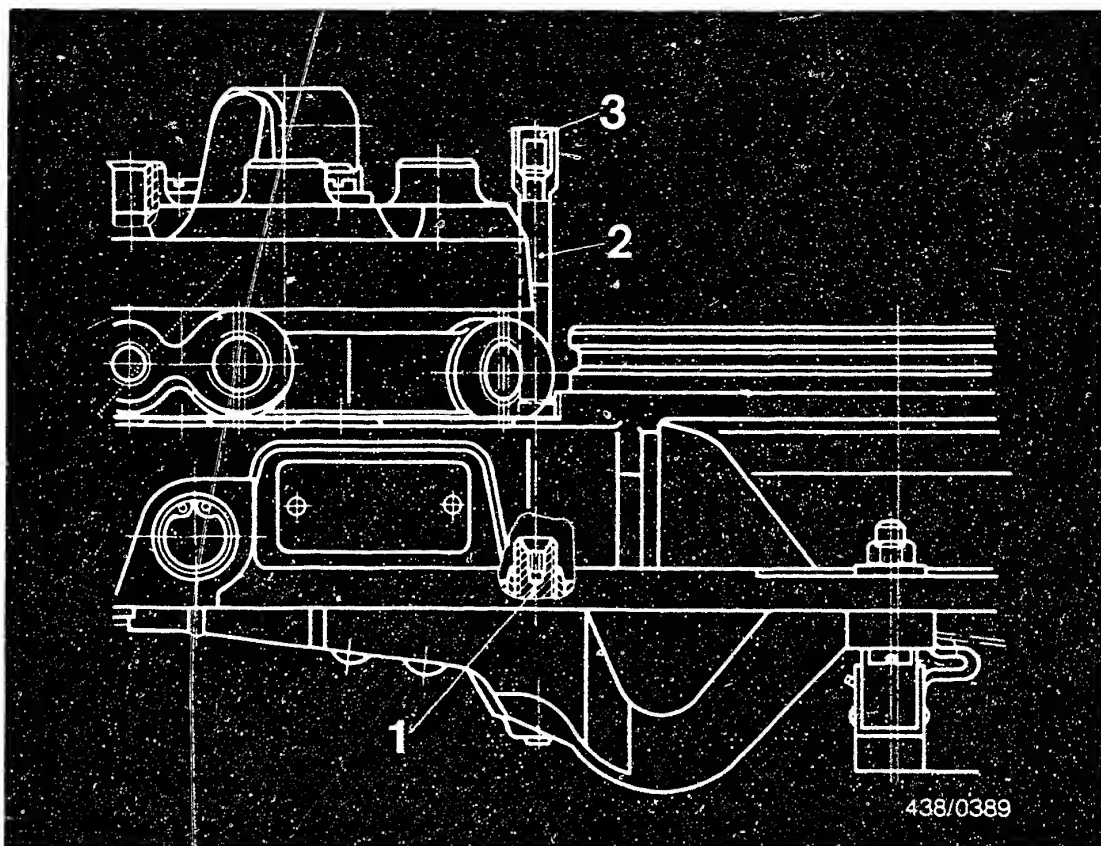




### 19.3 Adjusting the idle speed

The idle speed is adjusted, with the air filter mounted in position, at the bypass screw (arrow) on the throttle valve assembly.





#### 19.4 Adjusting the CO concentration

The CO concentration is adjusted by turning the idle-mixture-adjusting screw (1) in the mixture-control unit using the adjusting wrench KDEP 1035.

After removing the safety cap (3) of the guide tube (2), the adjusting wrench is passed through the guide tube and inserted into the idle-mixture-adjusting screw.

Turning to the right = richer mixture  
Turning to the left = leaner mixture



Caution:

Always make the adjustment from the lean side, i.e. if the mixture is too rich turn the idle-mixture-adjusting screw further to the left than necessary and then turn it to the right up to the setting required.

After every adjustment remove the adjusting wrench and accelerate the engine briefly, so that the air-intake system can cool off. Then wait until the indicator of the CO tester has stabilized. Never accelerate the engine with the wrench still in place as this could result in bending the control lever in the air-flow sensor.



### 19.5 Anti-tamper device for idle-mixture-adjusting screw:

In the Federal Republic of Germany, § 47 of the FMVSS/CUR, "Exhaust Gases and their Discharge", has been amended. This amendment order was printed in full in the Verkehrsblatt 13 of 15th July 1975.

Accordingly, all motor vehicles with externally supplied ignition produced as of 1 October 1976 must be provided with anti-tamper devices for the idle-mixture-adjusting screw so that it is not possible to adjust the screw without destroying the anti-tamper device. The intention is to prevent non-experts from re-adjusting the idle setting and thus inadmissibly influencing the exhaust gas. Consequently, the anti-tamper caps may only be used in the workshop and must not be sold to customers for their own use.

These anti-tamper caps come in different colors. The cap to be used for the after-sales service of updraft air-flow sensors is red.

It can be obtained from Bosch under part number

3 430 522 002.

The bore of the setting device (for receiving the adjusting wrench) is sealed by a plug.

The anti-tamper device for the air-flow sensor is removed and fitted using special tools (e.g. No. 131 090 from Cartool Co., Hans Schubert KG, Unterer Grasweg 88, D-8070 Ingolstadt).



## 19.6 Idle test specifications and settings:

- Conditions:

Engine at normal operating temperature.

Air conditioner switched off.

Vacuum limiter and auxiliary-air valve (or, Sweden model) inoperative.

- Idle speed

320i/520i : 850...950 min<sup>-1</sup>

- CO concentration

Europe model: max. 3.0 % by vol. CO

Sweden model: max. 1.5 % by vol. CO



# After-sales Service

## Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party.

### Packaging of goods under warranty

K-Jetronic (CIS)

**438**

VDT-I-438/101 B  
10. 1976

All components or assemblies of the K-Jetronic which are dispatched under warranty must be correctly and carefully packaged so that no further damage or impairments occur during transit, since these would not be covered by warranty.

Any fuel remnants must be removed from those K-Jetronic assemblies intended for dispatch, so as to eliminate any danger of fire during transit.

The intake openings and outlets of the assemblies must be sealed off with caps or plugs. As new products were fitted, the caps or plugs from these may be used.

The plunger of the fuel distributor is to be fitted with a protective cap of adequate size, or secured to the fuel distributor.

In addition, the assemblies are packed in tightly packed, well-sealed plastic sleeves. Fuel distributors and warm-up regulators are packed individually.

If components arrive damaged due to incorrect packaging or do not comply with these instructions, they can be returned and the warranty claim rejected.

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**L1**

Technical Bulletin

BMW 320i/520i 4-cylinder engine



# After-sales Service

## Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party.

### Securing of idle-speed adjusting screws

K-Jetronic (CIS)

**438**

VDT-I-438/102 B  
11.1976

According to a statutory regulation, changes have been made to § 47 of the German traffic licensing laws concerning exhaust gases and their outlets. This regulation was printed in full in traffic law sheet 13 of 15.7.75.

Consequently, all motor vehicles with external-ignition engines must have their idle-speed adjusting devices secured from the 1st October 1976, so that adjustment of the screw is impossible without destroying the securing device. This should stop unskilled people from adjusting the installation of the idle-speed system and thereby illegally influencing the emission values. As from now, securing caps can only be used in the workshop and cannot be sold to customers for their own use.

Securing caps are produced in various colors. For after-sales service the following caps and colors are used:

downdraft air-flow sensor

Blue

securing cap is not available from BOSCH.

Part number is DB 000.997.59 86 from the  
Deutsche Vergaser Gesellschaft K 34 520

updraft air-flow sensor

Red

Part number 3 430 522 002

These stipulations are only valid in countries where ECE regulations (Economic Commission for Europe) apply. The air-flow sensors must however be converted for the use of these securing caps, as a matter of principle. The caps can also be used in countries not subject to ECE regulations, to prevent dirt penetrating through the pipe to the adjustment in the case of updraft air-flow sensors.

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**L2**

Technical Bulletin

BMW 320i/520i 4-cylinder engine



# After-sales Service

## Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party

FUEL PUMPS 0 580 254 9..

438

with replaceable non-return valve

VDT-I-438/103 En

9.1978

On various new-model fuel pumps 0 580 254 9.., it is possible to replace the non-return valve. These pumps are recognisable by their light-metal housing and centrally arranged suction and pressure fittings. See also VDT-W-438/500.

The non-return valve in question, together with the necessary O-ring, is available as a set under the part number 1 587 410 901.

### Assembly

Clean the hose connection thoroughly at the pressure fitting and unscrew it.

Unscrew the non-return valve using a pin screwdriver (see Fig.).

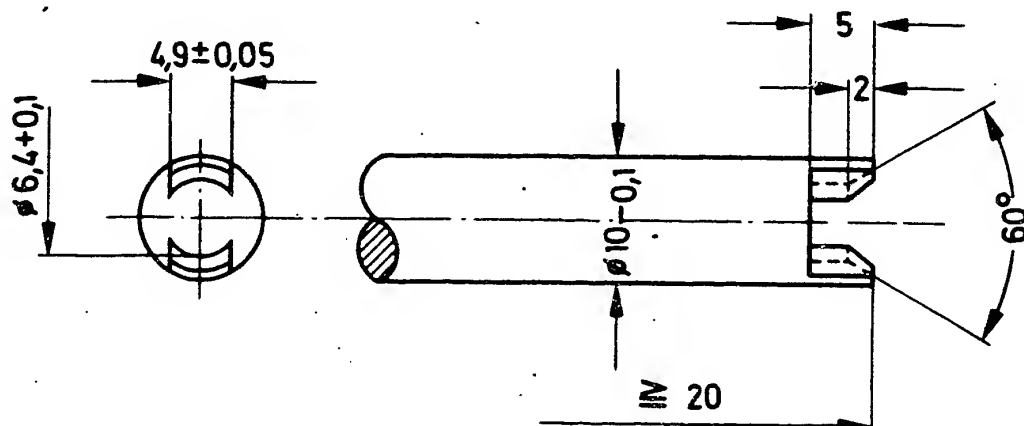
Screw in the new non-return valve.

Do not over-tighten. Tightening torque of 0.4...0.6 Nm (4...6 kgf/cm) is to be adhered to.

The thread is plastic. The non-return valve is sealed with an O-ring.

### Tool

Manufacture the pin-type screwdriver yourself according to the sketch. It can also be made from a conventional screwdriver with a 9...10 mm blade.



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**L3**

Technical Bulletin

BMW 320i/520i 4-cylinder engine



# After-sales Service

## Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party.

EXCHANGEABLE NON-RETURN VALVES  
in electric fuel pumps 0 580 254 ..

VDT-I-438/104 En  
3.1982  
(Replaces Ed. 9.1981)

Electric fuel pump	Parts set (non-return valve + seal ring)	Non-return valve	Seal ring
0 580 254 001	1 587 010 500	---	---
.. 002	.. 500	---	---
.. 950 }	1 587 010 006	---	---
.. 951 }	1 587 010 002	---	---
.. 952	.. 501	---	---
.. 953	.. 002	---	---
.. 954	.. 002	---	---
.. 956	.. 002	---	---
.. 957	.. 002	---	---
.. 958	.. 002	---	---
.. 959	.. 002	---	---
.. 960	.. 002	---	---
.. 961	.. 002	---	---
.. 962	.. 002	---	---
.. 963	.. 005	---	---
.. 964	.. 002	---	---
.. 965	.. 002	---	---
.. 966	.. 002	---	---
.. 967	.. 002	---	---
.. 968	.. 002	---	---
.. 969	.. 002	---	---
.. 970	.. 002	---	---
.. 971	.. 002	---	---
.. 972	.. 002	---	---
.. 973	.. 002	---	---
.. 974	.. 002	---	---
.. 975	.. 003	---	---
.. 976	.. 004	---	---
.. 977	.. 004	---	---
.. 978	1 587 410 901	---	---
.. 979	010 004	---	---
.. 980	.. 002	---	---
.. 981	.. 002	---	---
.. 982 ①	.. 003	---	---
.. 982 ②	1 587 410 901	---	---
.. 984	010 004	---	---

① = until FD 822

② = from FD 823

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**L4**

Technical Bulletin

BMW 320i/520i 4-cylinder engine



Electric fuel pump	Parts set (non-return valve + seal ring)	Non-return valve	Seal ring
0 580 254 985	...	1 583 385 006	1 580 203 002
.. 986	...	.. 386 011	.. 001
.. 987	...	.. 008	.. 001
.. 988	...	.. 008	.. 001
.. 989	...	.. 008	.. 001
.. 990	...	.. 385 004	.. 002
.. 991	...	.. 004	.. 002
.. 992	1 587 010 001	...	...
.. 996	...	.. 386 011	.. 001
.. 998	...	.. 385 004	.. 002





# After-sales Service

## Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party.

HOT-STARTING PROBLEMS

438

VDT-I-438/105 En

3.1980

K-Jetronic

Replaces Ed. 2.1980

Hot-starting problems can occur in various vehicles fitted with K-Jetronic. This means that when an engine is switched off whilst still hot and then switched on again after a short period, it does not start as well as it should.

The engine, the ignition system and the K-Jetronic system in these vehicles should be carefully checked. With the K-Jetronic particular attention should be paid to the:

- complete system (in case of leaks),
- injection valves (in case of leaks),
- correct position of the air-flow sensor plate (rest position).

Instructions can be found in the vehicle-related repair manuals VDT-W-438/5..

If the engine still does not start satisfactorily when hot, even after checking, a timing relay can be fitted in K-Jetronic systems which are not equipped with a solenoid valve for reducing the control pressure as additional starting help.

Timing relay 0 340 000 003 controls the start valve during hot starts. The start valve then injects extra fuel intermittently (sometimes cutting out completely).

The timing valve is fitted according to the wiring diagram (see reverse side). The fitting of this relay will be charged for.

After fitting the timing relay starting should be carried out as follows:

Vehicles with <u>start valve in intake manifold</u>	-	with <u>open throttle valve</u> ,
Vehicles with <u>start valve in idle duct</u>	-	with <u>closed throttle valve</u> .

**BOSCH**

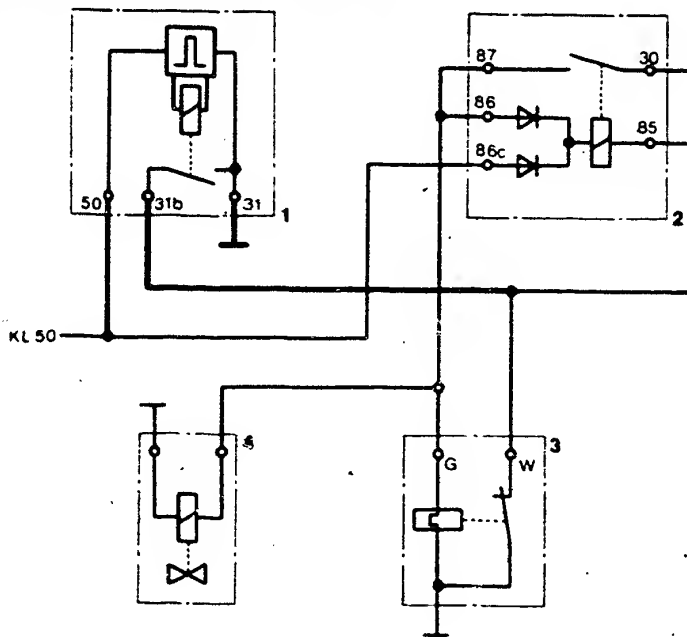
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**L6**

Technical Bulletin

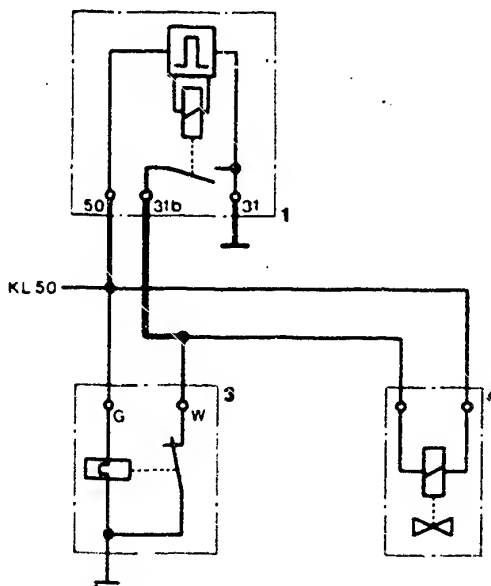
BMW 320i/520i 4-cylinder engine





K-Jetronic system with post-injection relay

- 1 = Timing relay 0 340 000 003
- 2 = Post-injection relay
- 3 = Thermo-time switch
- 4 = Start valve



K-Jetronic system without post-injection relay

# After-sales Service

## Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party.

### FIRMLY FITTED NON-RETURN VALVE

VDT-I-438/107 En

Repairs

5.1980

fuel pumps 0 580 254 ...

Previously fuel pumps with non-exchangeable non-return valve (see VDT-I-438/104 En) had to be exchanged completely in cases of leakage in the non-return valve.

If the fuel pump is in working order and only the non-return valve leaks, there is now the possibility of repairs as part of after-sales service. 2 parts sets have been produced for this purpose, they contain, amongst other things, a tube fitting with built-in non-return valve.

Before using the parts set the installation conditions should be checked. The defective non-return valve can remain in the fuel pump which does not have to be dismantled for fitting the parts set. Before disconnecting the fuel lines the pressure fittings of the fuel pump and the fuel lines should be thoroughly cleaned.

#### Description and fitting

##### Parts set 1 587 010 003 for fuel connection with inlet union.

Screw the tube fitting (short side) with the thick flat seal ring into the pressure fitting and tighten. In doing so press against the hexagon of the pressure fitting with a wrench. Place the thin flat seal ring, the fuel-line inlet union and the other flat seal ring on to the long side of the tube fitting and tighten with the hexagon cap nut. Run the engine and check that there are no leaks in the connection.

##### Parts set 1 587 010 004 for fuel connection with nipple and union nut.

Screw the tube fitting with flat seal ring into the pressure fitting and tighten. In doing so press against the hexagon of the pressure fitting with a wrench. Screw the fuel line to the tube fitting with a union nut and tighten. Run the engine and check that there are no leaks in the connection.

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**L8**

Technical Bulletin

BMW 320i/520i 4-cylinder engine



# After-sales Service

## Motor Vehicle Service Information

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### BMW 320i and 520i

with K-Jetronic

Delayed cold starting

VDT-I-BMW 010 B

6. 1977

A few complaints are being received regarding cold-starting difficulties in the 320 i and 520 i models. The cause can be an excessive amount of fuel being injected during cold starting.

These difficulties can be remedied by the retrofitting in the K-Jetronic system of an expansion tank 0 438 170 012 whose external appearance is similar to that of a fuel accumulator.

#### Parts required for the 320 i:

Expansion tank 0 438 170 012

#### BMW parts:

Quantity	Designation	BMW Part number
3	M 6 x 16 hexagon bolts	07 11 9 913 466
1	B 6 spring washer	07 11 9 932 072
1	Fuel line	13 31 1 265 284
1	Fuel line	13 31 1 265 285
1	A 10 hose clamp	07 12 9 952 010
1	Holder	13 31 1 265 293
1	Fuel hose 5 x 9 (as sold by the metre)	16 12 1 107 930

#### Installation

Remove the battery.  
Remove the fuel hose between the fuel filter and fuel distributor. Cut the fuel hose (5 x 9) to a length of 360 mm and attach it to the vent fitting of the expansion tank by means of the hose clamp. Fit new fuel lines to the expansion tank. Fit a straight line to the central connection.  
Install the expansion tank beneath the battery container. The two new fuel hoses can be seen from above. The angled hose is pointing towards the engine. Attach new fuel hoses to the fuel filter and fuel distributor. Suspend the hose end of the vent line through the recess of the front cross support. Install the battery.

#### Parts required for the 520 i:

Expansion tank 0 438 170 012

#### BMW parts:

Quantity	Designation	BMW Part number
1	Holding plate	13 31 1 265 310
1	M 6 x 16 hexagon bolts	07 11 9 913 466
4	B 6 spring washers	07 11 9 932 072
1	Fuel line	13 31 1 265 305
1	Inlet-union screw	32 41 1 117 181
2	Seal rings	07 11 9 963 201
1	Fuel line	13 31 1 265 304
1	A 10 hose clamp	07 12 9 952 010
1	Fuel hose 5 x 9 (as sold by the metre)	16 12 1 107 930

#### Installation

Remove the fuel hose between the fuel distributor and main fuel filter. Cut the fuel hose (5 x 9) to a length of 600 mm and attach it to the vent fitting of the expansion tank by means of the hose clamp. Fit new fuel lines and the holding plate to the expansion tank. Connect the short fuel line to the central connection. Attach the expansion tank to the spring strut support on the top left-hand side (as seen in the direction of travel) at the screw nearest to the engine. Fit new fuel hoses to the filter and fuel distributor. Attach the vent line to the coupling hose by means of a hose strap.

#### Warranty

If this conversion has to be performed during the warranty period, please send the customer to a BMW dealer. If the warranty period has expired, the conversion is to be charged to the customer.

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Motor Vehicle Service Information

BMW 320i/520i 4-cylinder engine



# After-sales Service

## Motor Vehicle Service Information

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### BMW 320i and 520i

with K-Jetronic  
Cold-starting difficulties

VDT-I-BMW 010 B

Suppl. 1

9. 1977

A few complaints are being received regarding cold-starting difficulties in the 320i and 520i models. Service Information VDT-I-BMW 010 B describes a similar case, in which these difficulties were remedied by retrofitting an expansion tank. Once again the cause may be an excessive amount of fuel being injected during cold starting.

This state of affairs can be remedied by retrofitting a post-injection relay with wiring harness.

#### Parts required:

Thermo-time switch 0 280 130 219 and for USA .. 214

#### BMW parts:

Quantity	Designation	BMW part number
1	Wiring harness	61 12 1 363 201
1	Relay	61 31 1 362 224
3	Cable straps	61 13 1 354 082

#### Warranty:

If this conversion has to be performed during the warranty period, please send the customer to a BMW dealer. If the warranty period has expired, the conversion is to be charged to the customer.

#### Installation:

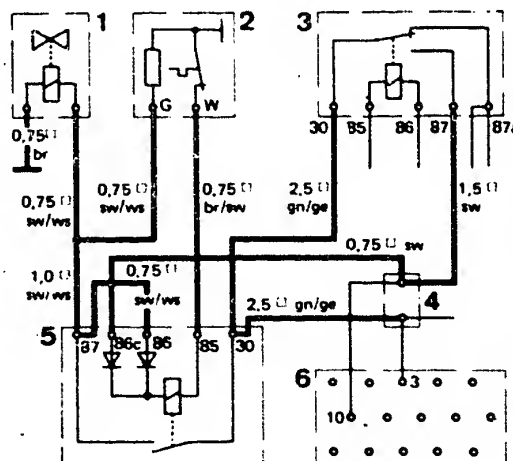
Lay the wiring harness with relay as per the circuit diagram. Attach the new wiring harness to the already existing engine wiring harness by means of the cable straps. Remove and insulate the two plugs, that of the start valve and that of the thermo-time switch, and fix them to the wiring harness. Connect the relay with one frame to the central electrical system (fuse and relay box) above the fuel-pump relay.

We recommended replacing the thermo-time switch on account of the hitherto continuous current load.

This modification has been allowed for in series production as of the following vehicle identification numbers:

3 762 945 — BMW 320i  
3 780 288 — BMW 320i RL  
4 454 662 — BMW 520i  
4 440 456 — BMW 520i RL

- 1 = start valve
- 2 = thermo-time switch
- 3 = relay
- 4 = plug-connection cable
- 5 = relay
- 6 = central connector



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Motor Vehicle Service Information

BMW 320i/520i 4-cylinder engine



# After-sales Service

## Motor Vehicle Service Information

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### BMW 320i, 520i

with K-Jetronic

Fuel delivery problems under hot conditions

VDT-I-BMW 011 B

10.1977

During very hot weather or in hot regions it can occur that, under extreme operating conditions, gas bubbles form in the fuel. The electric fuel pump is unable to deliver the requisite amount of fuel and the primary pressure drops. The primary pressure may even drop below the opening pressure of the injection valves, and the fuel pump is very loud.

As a result, the engine may run badly or even stall.

As a remedy, BMW have designed a modification set to deal with these extreme cases.

Any customers complaining of this problem should be directed to a BMW dealer.

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Motor Vehicle Service Information

BMW 320i/520i 4-cylinder engine



# After-sales Service

## Motor Vehicle Service Information

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### BMW 320i and 520i

equipped with K-Jetronic

Modifications to the K-Jetronic components,  
fuel distributor and thermo-time switch

VDT-I-BMW 020 En

7.1978

#### Fuel distributor

The fuel distributor 0 438 100 005 without pop-up valve was fitted in the 320i and 520i up to and including the 1976 models. As from the 1977 model the fuel distributor 0 438 100 023 with pop-up valve has been fitted.

In case of replacement requirements, the fuel distributor 0 438 100 005 can be replaced by ... 023. Modification using the following parts is necessary.

Fuel distributor 0 438 100 023

BMW Parts:

Quantity	Designation	BMW Part Number
1	Line	13 31 1 264 815
1	Line	13 31 1 264 739
4	Inlet-union screw	13 53 1 264 360
1	Inlet-union screw	13 31 1 264 830
1	Inlet union	13 31 1 263 262
10	Seal ring	07 11 9 963 042
2	Seal ring	07 11 9 963 072
4	Seal ring	07 11 9 963 129
1	Fuel hose 7.5 mm dia.	13 31 1 265 771
1	Inlet-union screw	13 31 1 265 734

#### Notes on assembly

The line with the end number ... 815 connects the return from the control-pressure regulator for warm-running compensation with the pop-up valve in the fuel distributor.

The line ... 739 connects fuel distributor and start valve.

The fuel hose ... 771 connects the fuel-distributor return with the metal pipe of the return.

#### Thermo-time switch

As from chassis number

3 774 200 – BMW 320i  
3 781 410 – BMW 320i RL  
4 461 977 – BMW 520i  
4 445 246 – BMW 520i RL

the switch-off point of the thermo-time switch was changed from 15 °C to 35 °C coolant temperature.

The thermo-time switch 0 280 130 219 with switch-off point 15 °C can be simply replaced by the switch 0 280 130 214 with switch-off point 35 °C.

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Motor Vehicle Service Information

BMW 320i/520i 4-cylinder engine



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